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THE  
**APIARIAN'S MANUAL;**  
• CONTAINING  
ALL THAT IS IMPORTANT  
IN THE  
**NATURAL HISTORY OF BEES,**  
OR USEFUL IN THEIR  
PRACTICAL MANAGEMENT.

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By T. M. HOWATSON,  
SCHOOLMASTER OF HUMBIE, EAST LOTHIAN.

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TO THE  
**Highland Society of Scotland,**  
THIS VOLUME  
IS HUMBLY DEDICATED  
AS A  
TESTIMONY  
OF THE  
HIGH RESPECT OF THE  
AUTHOR.

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## INTRODUCTION.

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**B**EES in every age have excited the attention of the curious; their natural history has always been a subject of interesting investigation to the philosophic naturalist, and the management of the apiary a source of happiness and emolument to the rural cottager. The information gained, however, in this department of natural history, has by no means "been proportionate to the multitude of investigators," and to the time and labour spent in the contemplation. Little additional knowledge was acquired for ages, and not until a comparatively late period was any thing done that could throw much light upon the subject.

This was not altogether owing to the want of a spirit of inquiry; but to the impossibility of observing what passed between the combs, even in glass skapes, as they were formerly constructed. In order to obviate this radical defect in the means of observation, Reaumur,

the celebrated French naturalist, used glass skapes so thin as to contain only two combs. These, however, it is evident, could not wholly remove the difficulty of observation, and the famous Swiss apiarian, Huber, found it absolutely necessary to make the frames which he used in his experiments so thin as to leave room for only one comb. Several of these frames placed parallel to each other, and closely connected, constitute what the inventor himself styles the *leaf* or *book-scape*, from its opening and shutting somewhat in the manner of the leaves of a book, so that when the different divisions are successively opened, both surfaces of every comb are at pleasure brought fully into view.

As will readily be imagined, the invention of the leaf-scape enabled M. Huber to prosecute his experiments with a facility and success unknown to former naturalists. His discoveries are numerous and important, they originated in his own experiments, and most of them have received the concurring testimony of later observers.

“ Among the few occupations which come within the sphere of action of the cottager, there is certainly no one which yields a greater profit compared with the disbursement, than the keeping of bees.” Instances are not wanting of persons, who, from small beginnings in

this interesting branch of rural economy, have accumulated considerable sums of money. This would be more generally the case were cottagers to increase their stock of bees : but this can hardly be expected, till a skape of an improved construction be brought into general use, that will easily enable the cultivator to share with his bees the fruit of their labours ; and thus avoid the no less injudicious than cruel custom of suffocating every year such vast numbers of bees, whose services next season would amply compensate for that portion of their store which a skilful apiarian would allow them to retain.

In speaking of bees, *swarm* is applied to those which leave their native abode, at a certain season of the year, like emigrants among men, in quest of a new habitation ; after the swarm is properly lodged, and has commenced operation, it forms a community called a *hive* ; and the lodging itself is called a *skape*.

Every community or hive of bees is composed of a single female or *queen*, a considerable number of males or *drones*, and *workers* to the amount of many thousands. The two first propagate the species ; while the workers perform all the other functions of the hive. The female or queen-bee gives birth to every individual of a community, and her presence is indispensably necessary to its prosperity and existence.

## ERRATA.

Page 10, line 13, for *analogus*, read *analogous*.

— 17, line 28, for *of*, read *over*.

— 48, line 25, for *ssign*, read *assign*.

— 76, line 1, for *thick*, read *broad*.

— 76, line 2, for *broad*, read *thick*.

# THE APIARIAN'S MANUAL.

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## CHAPTER I.

### OF THE FEMALE OR QUEEN.

*CHARACTERISTICS.*—The cultivator of bees ought to be so familiar with the external form and colour of the queen, that he can readily recognise her among a crowd of either males or workers. She is distinguishable by the yellowness of her belly, and by the great length of her body, and proportional shortness of her wings, which reach only to the third ring of the abdomen, while those of the workers and drones extend the whole length. When full of eggs she is thick and unwieldy, otherwise she is slender, tapering, and active. She has a sting of a bent form, though she has scarcely ever been known to use it, except to kill a rival of her own sex.

*Impregnation.*—The eggs of the queen are contained in two ovaries, which unite in

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a common oviduct that terminates in the last ring of the abdomen. It was long matter of dispute among naturalists in what manner the eggs were fecundated. The drones are evidently males ; but the most careful observers had never been able to detect any thing like sexual intercourse between them and the queen-bees.

Swammerdam remarking that the drones, at certain seasons, when collected in clusters, exhaled a strong odour, broached an opinion that the odour proceeding from whole clusters of drones, was a kind of *seminal effluvi-um*, which produced fecundation by penetrating the body of the female. There are frequently fifteen hundred or two thousand males in a hive, while there are only two or three queens to be impregnated in a season ; and Swammerdam seemed to have found, in his hypothesis, an easy explanation of this enormous disproportion in the numbers of the sexes. Reaumur, however, who thought that the queen's fecundation followed actual union, combated this fanciful doctrine : and M. Huber has confuted it by direct experiment. He confined all the drones of a hive in a tin case, perforated with minute holes, sufficient to allow any emanation to escape. This tin case was placed in a populous skape, where there was a young queen, who could

not fail to be subjected to the odour, but she remained barren.

Maraldi was the first to suggest another hypothesis, which apparently possessed a greater degree of probability; he imagined that the eggs were fecundated by the drones, after being deposited in the cells in a way analogous to the fecundation of the spawn of fishes by the milts. Mr. Debrow of Cambridge (in *Phil. Trans.* 1777,) strenuously supported this doctrine, and gave it a certain degree of plausibility, by referring to numerous experiments: he even affirmed, that the milt-like fluid of the drones might be seen in the cells. The supposition that the drones performed this important office, satisfactorily accounted for the prodigious numbers of them found in a hive. But Mr. Debrow does not seem to have attended to this circumstance—that great numbers of eggs are laid by the queen between the months of September and April, which prove fertile, although in that season there exist no males to supply the milt-like liquor. M. Huber proved by the strictest examination, that the appearance of a fluid was merely an optical illusion, arising from the reflection of the light at the bottom of the cells. He made the direct experiment of rigidly excluding every male from a hive, and yet

found the eggs laid by the queen in this interval were as fertile as when the males were admitted. Mr. Debraw's opinion, therefore, must be erroneous; for the fertility of these eggs must have depended on the previous impregnation of the queen herself, and not on any thing that could happen after they were deposited.

M. Hattorf, in a memoir published in Schirach's work, (*Natural History of the Queen Bee*, 1772,) endeavoured to show that the queen is impregnated by herself. This was also M. Schirach's opinion; and it seems to be that of Mr. Bonner. It is an opinion, however, that requires no refutation. The cautious Huber, remarking how much confusion had arisen from making experiments with queens taken indiscriminately from the skape, (the source of the error just mentioned,) thenceforward selected those which were decidedly in a virgin state, and with whose history he was acquainted from the moment they had left the cell.\*

The following experiments not only confute the opinion of Maraldi and Debraw, but also, in the most decisive manner, that

\* See the *Edin. Review*, No. 22, in which there is a full and beautiful analysis of M. Huber's letters to M. Bonnet, which letters now constitute only the half of the former naturalist's observations on Bees.

of Hattorf. "From a very great number of hives," says M. Huber, "I removed all the reigning females, and substituted for each a queen taken at the moment of her birth. The hives were then divided into two classes. All the males, both large and small, were taken from the first, and I adapted a glass tube at the entrance, so narrow that no drone could pass, but large enough for the free passage of the common bees. In the hives of the second class, I left the whole drones belonging to them, and even introduced more ; and to prevent them from escaping, a glass tube, also too narrow for the males, was adapted to their entrance. For more than a month I carefully watched this experiment, made on a large scale ; but, much to my surprise, every queen remained sterile. Thus it was proved that queens confined in a hive would continue barren though amidst a seraglio of males.

"This result induced me to suspect that the females could not be fecundated in the interior of the hive (skape,) and that it was necessary for them to leave it for receiving the approaches of the male. On the 29th of June, at eleven in the forenoon, we placed ourselves opposite to a hive containing an unimpregnated queen five days old. The sun had shone from his rising ; the air was

very warm ; and the males began to leave the hives. We then enlarged the entrance of that selected for observation, and paid great attention to the bees entering and departing. The males appeared and immediately took flight. Soon afterwards the young queen came to the entrance ; at first she did not fly, but during a little time traversed the board, brushing her belly with her hind legs ; neither workers nor males bestowing any notice on her. At last she took flight. When several feet from the hive, she returned, and approached it as if to examine the place of her departure, perhaps judging this precaution necessary to recognise it ; she then flew away, describing horizontal circles twelve or fifteen feet above the earth. We contracted the entrance of the hive that she might not return unobserved, and placed ourselves in the centre of the circles described in her flight, the more easily to follow her and witness all her motions. But she did not remain long in a situation favourable for our observations, and rapidly rose out of sight. We resumed our place before the hive ; and in seven minutes the young queen returned to the entrance of a habitation which she had left for the first time. Having found no external evidence of fecundation, we allowed her to enter. In a quarter-of-an-hour

she re-appeared ; and, after brushing herself as before, took flight. Then returning to examine the hive, she rose so high that we soon lost sight of her. This second absence was much longer than the first ; it occupied twenty-seven minutes. We now found her in a state very different from that in which she was after her former excursion, the organs distended by a substance thick and hard, very much resembling the matter in the vessels of the male, completely similar to it indeed in colour and consistence. In two days we found her belly swollen ; and she had already laid nearly a hundred eggs in the workers' cells." What M. Huber here takes for the generative matter, he afterwards discovered to be the male organs left in the body of the female, of which she divests herself with her feet.

It is obvious, therefore, from the result of these well-ordered experiments, that the young queens are never impregnated so long as they remain in the interior of the skape. To receive the approaches of the male, the queen soars high in the air, choosing that time of the day when the heat has induced the drones to issue from their dwelling ; and, except to accompany a swarm, love is now ascertained to be the motive of the only journey which a young queen ever makes.

From this excursion she returns in the space of about half-an-hour, with the most evident marks of fecundation, actually carrying away with her the genital organs of the poor drone, who never lives to see his offspring, but falls a sacrifice to the momentary bliss of his aërial amour. A wonderful deviation from the ordinary laws of nature! The most complete proof of these facts is afforded by the detail of a number of concurring experiments.

M. Huber assigns a satisfactory cause for the existence of such a great number of males. "As the queen is obliged to traverse the expanse of the atmosphere, (he observes) it is requisite the males should be numerous, that she may have the chance of meeting some one of them." But the reason why impregnation cannot be accomplished within the skape has not yet been ascertained.

It is curious that our countryman Bonner should have remarked those aërial excursions of the young queens, without ever suspecting their real object, or observing the marks of fecundation upon their return to the skape. The worthy bee-master thought they were merely taking an airing. "Often (says he) have I seen young queens take an airing on the second or third day of their age." On the 4th of July 1824, we had the

satisfaction of observing the queen of a second swarm that had been thrown on the 29th of June, return to her habitation, from her amorous flight : fortunately she did not immediately enter, but alighted on a hawthorn leaf, where we observed her with the most scrupulous attention. She certainly exhibited the appearance already mentioned, but much more conspicuously than we had anticipated, so much so, indeed, that we could not well conceive how her extraordinary appearance, on such occasions, had not caught the inquisitive eye of Mr. Bonner.

*Retarded Impregnation.*—In the natural order of things a queen begins to lay the eggs of workers forty-six hours after impregnation, and continues during the subsequent eleven months to lay these only ; she then commences the laying of drone eggs also, generally to the amount of from fifteen hundred to two thousand ; after which, without any further communication with the male, she resumes the laying of workers' eggs. Indeed M. Huber believes that one union is sufficient to fecundate all the eggs that a queen will lay during her whole life : but he wants absolute proof for more than two years. When, on the contrary, impregnation is retarded beyond the twentieth day

after the queen's birth, she begins to lay forty-six hours, indeed, after fecundation, but, in this case, the eggs produce drones only, and she lays no other kind during her whole life. Our limits do not permit us to detail the interesting experiments of M. Huber on this obscure subject. He occupied himself for more than two years with experiments on retarded fecundation, and had constantly the same results. We forbear hazarding any conjectures on the remote cause of this extraordinary fact. We are unacquainted with any analogous case in physiology, and Huber himself acknowledges, that "it is an abyss wherein he is lost." The fact itself, however, is indubitable.

*Brood.*—The eggs from which workers are produced are deposited in common horizontal cells; the cells for males are also horizontal, but of larger dimensions; those destined for queens, however, have a vertical position with the mouth downwards. They are generally attached to the edge of the middle combs, or to the edges of the communications or passages through them. The royal cells are of a circular pyramidal form, constructed with a profusion of wax, and, when completed, are about an inch and a

quarter long. When only sketched, and very like the cup of an acorn, queens lay in them.

The fecundity of the female bee is so great, that a single individual belonging to a numerous hive, in genial weather, frequently lays 350 eggs in a day; in weak hives, however, the half of this number is rarely exceeded; and, at a low temperature, laying is altogether suspended. The queen, taught by "a ruling nature," as Shakespear has it, in the choice of the proper cell, inserts the posterior part of her body, and fixes to its bottom her little egg, composed of a thin white film, enclosing a whitish liquid.

At the end of three days the eggs are hatched; queens and workers then remain five days in the vermicular state, and the drones six and a half. During this stage of their growth, the larvae of males and workers are, from time to time, assiduously fed by the working bees with a whitish jelly, in which the fecundating dust, farina, or pollen, found on the stamina of flowers is the principal ingredient. This jelly is at first tasteless, but as the larvae advance in age, it is supplied of a taste rather saccharine. The food of the royal larvae is, however, pungent, and much more copiously administered. At last the larvae leave off eating, and the workers seal up the mouths of the cells with a

covering of wax, formed of concentric circles begun at the edge, convex, if including males, but flat if including workers. The worms of workers and drones, thus enclosed, soon begin to spin, in the manner of silkworms, a white silky envelope or cocoon, which completely surrounds their bodies; females, however, on account of the wideness of their cell, are unable to spin complete cocoons, the greater part of the posterior of their abdomen being left uncovered. The brood in this enveloped state are called *nymphs*.

Reckoning from the moment an egg is laid, a queen attains the winged state in sixteen days, a worker in twenty-one, and a drone in twenty-four. All the metamorphoses, however, are slower in very small communities, or during cold weather. As soon as a young bee escapes from its prison, the working bees immediately clean it out, that it may either be fit for a new inhabitant, or a receptacle for honey. The royal cells are, however, but once inhabited, and, having served their purpose, are generally demolished.

*The Workers are Females.*—The working bees are not *neuters*, as denominated by many authors. It is equally repugnant to rea-

son and adverse to the laws of nature, to suppose that there are animals of any description devoid of sex. The common bees are really females, whose organs of generation are not unfolded; they are capable, however, of having their organs fully developed, and of becoming perfect fertile females, if reared in spacious cells, and fed with royal food, before the end of the third day of their vermicular state. Hence when a hive loses its queen, the workers have the power of obviating their own ruin, provided there are workers' eggs in the cells, or maggots not above three days old.

This very important fact was the discovery of Schirach, and has since been established beyond controversy by Huber, Bonner, and hundreds of others. Bees are soon aware of the loss of their queen, and in a few hours commence the labour necessary to repair their misfortune. They select several cells containing eggs or young larvae, demolish three of the cells contiguous to each to afford room, and surround the future queens by a cylindrical enclosure, rendering their cells perfect tubes, which, like the other cells of the comb, are horizontal. When the larvae attain the third day of their age, the bees lengthen the tubes, but work them downwards, at right angles to the part previ-

ously constructed after the pyramidal fashion of other royal cells. The larvae are copiously fed with royal jelly from the beginning, attain maturity in the usual time, and are, in every respect, perfect females. It is not necessary to success, that the eggs or the worms be selected by the bees themselves; for, as demonstrated by M. Huber, they can procure queens equally well by operating on worms selected for them.

Another very convincing proof that the workers are of the female sex is, that fertile common bees are always produced in hives that have lost the queen, and these fertile workers are invariably produced in the vicinity of the royal cells. The bees, while rearing the royal larvae, either by accident, or by a particular instinct, the principle of which is unknown, drop some particles of royal jelly into the cells contiguous to those containing the worms destined for queens. The larvae of workers that thus receive among their own food, portions of this active aliment, for no other can unfold the germ, are affected by it, and their ovaries acquire a certain degree of expansion: from the small quantity of royal food which they receive, however, and, owing to the smallness of their cells, this expansion is only partial. Such fertile workers resemble common

bees in all the external characteristics, as well as size, and lay only a few eggs ; and these eggs, like those of queens whose impregnation has been retarded, produce drones only. This singular discovery was made by M. Reims, and is incontrovertibly confirmed by the experiments of M. Huber, who says, that the result is so uniform, that he can, by removing the queen from a hive, obtain fertile workers whenever he pleases ; and the reason why they are so seldom seen is, that they are attacked and destroyed by the young queens reared in the royal cells. Neither their use in hives, nor their mode of fecundation has been ascertained.

*Combats of Queens.*—There ought to be but one queen in a hive : therefore it is necessary when a supernumerary one is produced naturally, or is introduced in the course of experiment, that one of the two must be destroyed. The German naturalists, Schirach and Reims, imagined that the working-bees assailed the stranger, and stung her to death. Reaumur considered it as more probable, that the sceptre was made to depend on the issue of a single combat between the claimants ; and this conjecture is verified by the observations of Huber. The same hostility towards rivals, and destructive

vengeance against royal cells, animates all queens, whether they be virgins, or in a state of impregnation, or the mothers of numerous broods. The working bees, it may be remarked, except during the swarming season, remain quiet spectators of the destruction, by the first hatched queen, of the remaining royal cells; they approach only to share in the plunder presented by their havoc-making mistress, greedily devouring any food found at the bottom of the cells, and even sucking the fluid from the abdomen of the nymphs before they toss out the carcasses.

It has already been noticed, that the cocoons of queens are incomplete, leaving uncovered the greater part of the abdomen; and it remains here to be mentioned, that this is owing to the increased diameter towards the base of royal cells; for common larvae placed in wide cells cannot do otherwise; while royal larvae placed in cells of small diameter spin complete cocoons. Were the silken envelope to surround completely the bodies of the female larvae, the sting of the queen who seeks their destruction, would be entangled among the threads, and thus not only endanger her own life, but even the existence of the whole community.

Nature, however, wisely opposes no obstacle to the massacre.

The following fact connected with this subject is one of the most curious perhaps in the whole history of this wonderful insect. Whenever the workers perceive that there are two rival queens in the hive, numbers of them crowd around each : they seem to be perfectly aware of the approaching deadly conflict, and willing to prompt their amazonian chieftains to the battle ; for, as often as the queens show a disinclination to fight, or seem inclined to recede from each other, or to fly off, the bees immediately surround and detain them ; but when either combatant shows a disposition to approach her antagonist, all the bees forming the clusters instantly give way to allow her full liberty for the attack. It seems strange that those bees who, in general, show so much anxiety about the safety of their queen, should, in particular circumstances, oppose her preparations to avoid impending danger,—should seem to promote the battle, and to excite the fury of the combatants.

“ Bees are not immediately aware of the removal of their queen ; their labours are uninterrupted ; they watch of the young, and perform the whole of their ordinary occupations. But, in a few hours agitation ensues ;

all appears a scene of tumult in the hive. A singular humming is heard ; the bees desert their young, and rush over the surface of the combs with delirious impetuosity. Then they discover that their queen is no longer among them ;” and the rapidity with which the bad news now spreads through the hive, to the opposite side of the combs, is very remarkable. On replacing the queen in the hive, tranquillity is almost instantly restored. The bees, it is worthy of notice, *recognise* the individual person of their own queen. If another be palmed upon them, they seize and surround her, so that she is either suffocated or perishes by hunger ; for it is very remarkable, that the workers are never known to attack a queen bee with their stings. If, however, more than eighteen hours have elapsed before the stranger queen be introduced, she has some chance to escape : the bees do at first seize and confine her, but less rigidly ; and they soon begin to disperse, and at length leave her to reign over a hive in which she was at first treated as a prisoner. If twenty-four hours have elapsed, the stranger will be well received from the first, and at once admitted to citizenship, and regarded as the hope of the community. In short, it appears that the bees when deprived of their Female, are thrown into great agita-

tion; that they wait about twenty hours, apparently in hopes of her return; but that at the end of this time the agitation ceases, and they set about supplying their loss by beginning to construct royal cells. It is when they are in this temper, and not sooner, that a stranger queen will be graciously received: and upon her being presented to them, the royal cells, in whatever state of forwardness they may happen to be, are instantly abandoned, and the larvae destroyed.

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## CHAP. II.

### OF THE MALES OR DRONES.

*Characteristics.*—The Male or Drone bees are readily distinguished by their large size, and heavy “*droning* flight.” They are destitute of a sting, and their proboscis or trunk not being required for the purpose of collecting honey from the flowers, but only for imbibing it from the cells, is shorter than that of the workers; for nature has assigned them another task than the drudgery of labour.

*Little Drones.*—It will be recollected that queens, whose impregnation has been retard-

ed, lay eggs producing drones only ; and it may here be mentioned, that the instinct of such queens is probably defective, for they deposite their eggs indiscriminately in drone and in common cells, and even in royal ones, some of which are always constructed whenever a queen, either in a natural or retarded state, begins to lay male eggs. Drones produced in royal cells are not above the usual size ; but those produced in common cells are cramped in their growth, only attaining the size of common bees. This accounts for the little drones observed by Debraw and other naturalists, whose assertions are corroborated by the weighty testimony of M. Huber. Mr. Bonner, because he could find none in two small hives, the queens of which were *fertile in worker-eggs*, denies the existence of little drones altogether, and speaks of Mr. Debraw in a very sarcastic, unbecoming manner. The candid narrative of an impartial naturalist, even when he has the misfortune to be mistaken, ought to be received with respect ; but, at all events, his patient investigations, minute researches, and assiduous labours in the cause of truth, certainly merit a better reward than bitter jokes.

*Massacre.*—The drones enjoy the sweets of life and love but for a short period, gen-

erally making their appearance in May, and perishing in August or September. Their early appearance in summer, and destruction in autumn, are certain indications of the prosperity of a hive. The massacre of the males never commences till the season of swarming is past; but sooner or later the day of death arrives. The drones, harassed and driven from the upper parts of the comb, generally seek safety in flight; those who return are stung to death on the board in the interior; in doing which the workers force their stings so deeply into the bodies of their unfortunate victims, that they are obliged to turn two or three times rapidly round on their stings, as on a pivot, before they can disengage themselves. Some, however, are not stung at all, but merely have their wings gnawed and broken at the roots, and, thus disabled, they crawl about on the ground till they, as well as those which fled for safety, perish through cold or famine, or become the prey of birds or other animals.

*Exceptions to the general Massacre.*—It is not, however, by a blind or indiscriminating instinct that the workers are impelled thus to sacrifice the males; for if a hive is deprived of its queen, no massacre of the males takes place in it, while the hottest persecu-

tion rages in all the surrounding hives. In this case the males are allowed to survive over winter. Mr. Bonner had observed this fact ; he supposed, however, that the workers thus tolerated the drones for the sake of the additional heat they generated in the hive ; but we now see the true reason to be, that their aid is needed to impregnate a new queen. The drones are also suffered to exist in hives that possess fertile workers, but no proper queen ; and, what is remarkable, they are likewise spared in hives that have a queen whose impregnation has been retarded. Here, then, we perceive a counter instinct opposed to that which would have impelled them to the usual massacre.

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### CHAP. III.

#### OF THE FEMALE NON-BREEDERS OR WORKERS.

*Characteristics.*—The characteristics peculiar to the working bee are, the *basket* on the hind legs, the long trunk, and the straight sting.

*Organs.*—Most of the organs which we are here to take notice of are, with certain

modifications, common to queens and drones, as well as to workers. The body of a bee is divided by two tubular ligaments, into the head, breast, and belly or abdomen. The head is furnished with two articulated, flexible horns, called *antennæ*, the use of which has not been fully ascertained. The most generally received opinion is, that they are the organs of a delicate sort of feeling. The head is also provided with two teeth or mandibles, which serve instead of hands, on almost every occasion; and a proboscis or trunk, an implement of curious construction, with which bees probe the flowers, and extract their sweets: when unemployed it is folded under the head, and properly defended by a scaly sheath or covering.

The middle portion or breast of a bee sustains the wings, which are four in number, together with six legs. The body of a bee is covered with a sort of branchy hair, which arrests the farinaceous particles, while the insect rolls itself, for that purpose, among the stamina in the cups of the flowers. The dust with which the body of the bee thus becomes covered, is brushed together with its middle pair of legs, and kneaded into little balls, which it carries to its habitation in a small hollow, called by Reaumur "the basket," in each of the two hind legs.

The exterior of the abdomen is composed of six circular overlapping scales, connected by membranes. Within these scales or rings are the intestines, the honey-bag, the venom-bag, and the sting. The office of the intestines, as in other animals, is to digest the food. The honey-bag is a reservoir that contains the honey, as it is gradually collected from the flowers, the contents of which are afterwards disgorged into the cells. The sting is composed of a finely pointed sheath and two very small barbed darts: the sheath makes the first penetration, through an opening at the point of which are instantly launched the two darts, between which the poison passes along into the wound, from the venom-bag. The animal, it is said, can elevate or depress the barbs of the darts at pleasure; if this be really true, we cannot well account for bees leaving their sting in the wound which they inflict in the human body, and thus becoming the sacrifice of their own vengeance, unless it be that their fears prompt them to seek safety in a too hasty retreat.

*Precautions against being Stung.*—A person may sit and observe his bees, or even walk steadily about in his apiary in safety, provided he adopt the precaution of keeping

his lips close, breathing gently through his nostrils only, and when a bee approaches his face, let him remain perfectly motionless, and the wary insect will seldom commence actual hostilities. When there is a copious secretion of honey in the flowers, however, and the bees are in full operation, it is dangerous to approach them unless properly defended; and this is particularly to be attended to when any operation is to be performed. The best defence for the face and back part of the neck, is a veil of gauze, or such thin material, tied round the hat, and drawn close round the neck below. The brim of the hat will keep it sufficiently off the face. The hands may be protected by a pair of leather gloves: woollen ones, unless very thick, are no defence.

*Remedies for a sting.*—The effects of the poison vary according to the constitution of the individual stung, and different constitutions require different remedies. When a person is stung, the sting ought to be immediately extracted, and the part pressed with the head of a tobacco pipe, to prevent the poison from being absorbed, and by sucking at the extremity of the stalk the poison will be extracted; the part may then be washed with vinegar to prevent inflammation. A

few drops of laudanum, or of olive oil, applied to the wound are said to be very efficacious remedies, and might easily be kept in constant readiness in a small phial.

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## CHAP. IV.

### O F H O N E Y.

Saccharine matter abounds more or less in all vegetables ; their life depends on its presence, and every root and earthly production is nutritious in proportion to the quantity of saccharine principle it contains. When plants, in their respective seasons, put forth their blossoms, part of the circulating saccharine juice exudes into the nectary or honey-cup of the flowers, and is thence collected by the bees, forming what is called *honey*.

A moist, sultry atmosphere, charged with electricity, by accelerating the circulation of the vegetable fluids, is most favourable to the secretion of this substance. " Heat too long protracted, however," as M. Huber justly observes, " and its concomitant drought, chill rains, and a north wind, entirely suspend the elaboration of honey in vegetables." If the weather is such, however, as to allow

the bees to venture abroad, they will not remain idle, but will employ themselves diligently in collecting farina as food for their young.

In the month of July the air is sometimes so sultry that honey is found, not only in the nectary of flowers, but even on the leaves of certain plants and trees. The great heat, as we imagine, attracts the juices, which, perspiring through the pores of the leaves, are, during the day evaporated, and the current of sap, thus set in motion, continues to flow for a considerable time after the sun is set: but as, during the night, it does not pass off in vapour, the saccharine matter remains on the surface of the leaves, and presents a rich booty to the bees early on the following morning. Such a favourable season, however, does not occur every year, and even when it does, is always of short duration. It is evident, therefore, that the great supply of honey is obtained from the flowers.

When the state of the country affords a copious collection of honey, the bees are extremely anxious to collect it. At such an auspicious juncture, let the master dread the consequence of standing in the way of his irritable servants. The entrances of their habitations then exhibit a scene of impetuous activity that baffles description; avoiding

all delay, the assiduous little animals dart away in quest of their darling sweet with a cheerful, sharp-sounding buzz; a peculiar aromatic odour emanates from the skapes; and the distended bellies of those returning from the fields, indicate that they are gorged with honey. Such favourable appearances inspire sanguine hopes. The luscious load which a bee has collected in its excursion is disgorged into an appropriate cell, which, by repeated accumulations, is filled, and then sealed up with a thin waxen covering of concentric circles, begun at the circumference and closed in the centre.

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## CHAP. V.

### OF WAX.

Wax, as well as honey, is secreted by certain vegetables, and owes its origin to the saccharine principle. It exudes through the fruit and the tender young leaves of certain plants forming a silvery varnish on their surface, whereas exudations of honey are never observed but on leaves that have attained their full size. Several plants contain wax in such abundance as to make it worth while

to collect it from them. The wax myrtle, (*myrica cerifera*,) a shrub of North America, produces a berry fruit which affords a pale-green wax in large quantity. A number of other plants afford by decoction a similar inflammable concrete. It exists, too, in some vegetable products combined with resin.

But the great supply of wax, and that of the best quality, is secreted in the body of the bee. It transudes in a liquid state through the membranaceous bases of the rings of the abdomen; it then coagulates between the plates of the under side of the belly, forming small white scales, great numbers of which may be observed about the entrance of a skape, in which a swarm has been recently settled,—a sure token that the hive is constructing comb.

It was long believed that the pellets of farina carried home on the hind legs of the bees were swallowed, and afterwards disgorged as wax. It is now put beyond a doubt, however, that the only purpose to which this substance is known to be appropriated, is the nourishment of the brood. Hence it is not unaptly styled *bee-bread*. That pollen is not the basis of wax, may be readily conceived from the following considerations; namely, that the pellets are of different colours on different bees, but always

of the same colour on both legs of the same bee ; whereas the shade of new comb is uniform. The farina is collected with greater avidity for old hives, where the comb is complete, than for those where it is only begun, which would hardly be the case were it the elements of wax. Little of this substance is carried by the bees of a new colony until two days elapse, when the number of gatherers increases, because some cells are then formed wherein to store it up as food for the expected progeny.

That the saccharine principle, and not farina, is the source of wax, is demonstrated, in the most satisfactory manner, by M. Huber. “ On the 24th of May, (says he) we lodged a swarm which had just left the parent stock in a straw hive, (skape) with as much honey and water as necessary for the consumption of the bees, and closed the entrance so as to prevent all possibility of escape, leaving access for renewal of the air. At first the bees were greatly agitated ; but we succeeded in calming them by carrying the hive to a cool dark place, where their captivity lasted five days. They were then allowed to take flight in an apartment, the windows of which were carefully shut, and where the hive could be examined conveniently. The bees had consumed their

whole provision of honey ; but their dwelling, which did not contain an atom of wax when we established them in it, had now acquired five combs of the most beautiful wax suspended from its arch, of a pure white, and very brittle." But as this wax might have been produced from farina collected previously to the confinement of the bees, and as the source was not inexhaustible, they were again imprisoned, with a new portion of honey, and from the evening of the subsequent day, they were observed working in wax as before ; and on examining the hive on the third day, other five combs were found to have been constructed. The combs were removed five times successively, the bees being always prevented from leaving the apartment ; " and, during this long interval," (M. Huber does not specify the precise time, but it cannot have been less than eleven days,) " the same insects were preserved and fed with honey exclusively. On each occasion that we supplied them with honey they produced new combs, which puts it beyond dispute, that this substance effected the secretion of wax in their bodies without the aid of pollen ;" for all supply of this substance, with which the bees could have provided themselves, must have been wholly exhausted

long before the termination of their imprisonment.

Bees fed with a mixture of honey and sugar, or with sugar alone, produce wax sooner, and in greater abundance, than those fed with honey. Six ounces of dark-brown sugar reduced to syrup yield about one ounce of the whitest wax ; while a like weight of the brightest refined sugar yields about half an ounce ; and though in greater quantity, yet darker than that produced from honey.

“ Mutual relations subsist between honey and wax in their elementary principles, and the one is dependant on the other. Those years unproductive of honey are also unproductive of wax.” Bees do not construct comb unless they can procure honey in great abundance ; swarms recently lodged ought, therefore, to be copiously supplied, during unfavourable weather, with syrup of brown sugar.

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## CHAP. VI.

### OF PROPOLIS.

Propolis is a resinous, odoriferous gum, more tenaceous than wax, and generally of a

dark-brown colour. It is used by the bees in forming a firm basis to their combs, in stopping every unnecessary opening, and in gluing the skape to the board. It is also employed by our sagacious insects in forming an envelope to the dead body of any animal, as a snail or a mouse, which they have stung to death, as the reward of intrusion, but which, from its size, they have not been able to drag out of the skape, as is always done with every manageable nuisance. The decomposition of the body thus goes on, within its tomb, without being either offensive or injurious to the community.

Authors are not agreed as to the origin of propolis, or whence it is procured by the bees. Some are candid enough to acknowledge their ignorance of the subject; others are of opinion that, like wax, it is a secretion in the body of the bee; while many think that the bees collect it from the poplar, birch, fir, yew, and willow. M. Huber, whose testimony merits the greatest deference, informs us that, for many years, he had fruitlessly endeavoured to surprise the bees collecting propolis on trees, though he had seen multitudes returning with it on their limbs. At last, however, in the month of July, he had the satisfaction of witnessing bees load themselves with this substance from

some branches of the wild poplar, that had been cut in spring. Branches recently cut did not seem to attract these insects ; but he assigns as a reason, that their viscous matter had less consistence than those that had been longer cut.

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## CHAP. VII.

### OF THE COMB.

Immediately after a swarm is skaped, the bees hasten to construct cells, to receive the eggs of their queen, or to contain honey. The cells are hexagonal tubes, having a hollow pyramidal bottom, composed of three equal and similar lozenges\* uniting in a common centre. This pyramidal cavity in the bottom forms a slight elevation on the other side, there corresponding to three cells partially common to the whole. The first row of cells has only five sides of wax, the top of the skape constituting the sixth side. All this, however, will be best understood by inspecting a piece of comb.

The bees begin by constructing one small

\* A lozenge is a figure like a *card-diamond*, or, to speak more scientifically, it is a geometrical *rhomb*.

piece of comb, which serves as a direction for all the rest ; two other combs are afterwards begun, one on each side of the first, equally removed from it and parallel ; after these are a little advanced, the foundation of other two are laid, in a position parallel to the preceding. All are extended in proportion to their earlier origin ; that in the middle being the farthest advanced.

The combs are fixed to the top of the skape, and carried perpendicularly downwards. Their average thickness may be stated at about an inch : they are parallel to one another ; and have an interval of one third of an inch between each. These are general laws ; but the bees, under peculiar circumstances, sometimes deviate from them.

When there is an opportunity for a very great collection of honey, both the diameter and depth of the cells are greatly augmented ; so much so, that, where the space will admit, the combs are made so thick as to exceed an inch and a half. Sometimes, also, instead of being right-lined and parallel, they are bent, diverge from one another, or are placed at right angles ; “ But on following all the minutiae of labour, we can, for the most part, assign reasons for the apparent anomalies. These insects are obliged to adapt themselves to localities : one irregu-

larity produces another, and it usually originates in the arrangements which we make them adopt. The inconstancy of the temperature of the atmosphere affects the symmetry of the combs, from frequently interrupting the operations of those bees entrusted with their construction. We have remarked, that less perfection is offered by a work resumed, than one of uninterrupted labour."

When a pane of glass is interposed between the bees and the top of the skape, for they avoid very smooth surfaces, they work the comb upwards from the bottom. When both the top and bottom are covered in like manner, they fabricate the comb horizontally from one side to the other. These cunning architects advance their work quickest in descending, and slowest in ascending; but in either case the comb is vertical, which is always preferred to the horizontal position.

The cells on both sides of the comb can thus be filled with honey; which is retained from escaping by its own viscosity, its affinity to wax, and by the upward inclination of the cells from their base; for the cells are not perfectly horizontal, but deviate from the level of the horizon sometimes above  $20^{\circ}$ , and commonly 4 or  $5^{\circ}$ . The knowledge of this fact enables us to ascertain the origi-

nal position of a comb, though detached. We have observed that the surface of the honey, while in progress of accumulation in the cell, is concave; and upon this may, perhaps, partly depend its retention in the cells.

It was before mentioned, when treating of the brood, that there are appropriate cells for males, females, and workers respectively. The combs are never begun with the cells destined for males; but when the queen is ready to lay male eggs, the bees immediately begin to construct larger cells, gradually giving them greater diameter, and finally preparing a cradle for the whole masculine race. After building thirty or forty rows of a proper size, they return to the usual proportions by similar gradations.

New comb is white, but it soon becomes yellow; it grows brown in time, and very old comb has a blackish hue. The source of the subsequent yellowness of wax has not yet been ascertained. It has been generally supposed to be produced by the vapours of the hive,—an opinion rendered doubtful by an experiment of M. Huber. He is inclined to ascribe it to the direct action of different parts of the body of the bees upon the comb.

## CHAP. VIII.

## OF THE FORMATION OF SWARMS.

Bees are not torpid in winter, as some have supposed: when the thermometer in the open air is several degrees below freezing, it stands at 86° and 88° in skapes sufficiently populous. The bees then cluster together, and move to preserve their heat. In strong hives that are well provisioned, and properly covered from cold, brood of all ages may frequently be found, even in the month of January, as experienced by M. Huber when the interior heat was 93°.

The fecundity of the queen is always in proportion to the temperature of the atmosphere. During spring, therefore, strong hives receive a very great increase to their working population. About the end of spring or the beginning of summer, the queen having then laid common eggs exclusively during eleven months, commences the laying of male eggs also, and continues for about thirty days to lay these and common eggs alternately; and regularly on the twentieth or twenty-first day of the male-laying.

several royal cells are founded, in which the queen deposits eggs, that, in due time, produce other queens.

In about thirty days the queen, who, a few weeks before could hardly drag herself along, having then finished her laying, becomes light and active; and the larvae, hatched from the eggs laid in the royal cells, being, at that time, ready to transform to nymphs, the queen, from some unknown cause, perhaps the anticipation of rivals, suddenly becomes agitated, runs heedlessly over the combs, and wherever she goes her disorder is insensibly communicated to the workers. The first that are aroused by her motions, run after her in the same disorderly manner, and, in their passage, excite those still tranquil on the combs. The track of the queen is evident after she has left it, by the agitation created, which is never afterwards quelled. She soon visits every part of the comb, and disseminates a general sensation: if some places still remain tranquil, the bees in agitation arrive, and communicate their disorder. The bees cease to watch over the young; they run about in every different direction; even those returning from the fields, during this confusion, no sooner enter their dwelling, than they participate in these tumultuous motions. Neglecting to free them-

selves of the pellets on their limbs, they hurry blindly about. At last the whole rush precipitately out of the skape, and the queen along with them.

It is now ascertained beyond dispute, that the old queen uniformly goes off with the first colony, and that instinct should impel her to do so appears necessary ; for that she being the strongest, would never have failed to have destroyed the young queens as they attained maturity, and the species would have become extinct. An old queen, as has been already said, never quits her abode at the head of a swarm, till she has finished her laying of male eggs ; but this is of importance, not merely that she may be lighter and fitter for flight, but that she may be ready to begin with the laying of worker eggs in her new habitation, workers being the first needed in order to secure the continuance and prosperity of the newly founded commonwealth.

It is well to remark that royal cells are prepared by the bees only when the queen lays male eggs, and even not then, unless the bees be very numerous ; they should be even superabundant : for, if the hive is weak, no royal cells are constructed, and consequently there will be no swarm : the old queen will remain until the following spring ; and if the population is then sufficient, royal cells will

be constructed, and after depositing eggs in them, she will issue forth with a colony, before the young queens are produced.

*Second Swarm.*—Although all the bees of a hive partake of the agitation preceding swarming, still all those endeavouring to depart do not become members of the new colony: those that have lately left their cells, and considerable numbers whose wings are moistened by the perspiration caused by the heat during the agitation, are incapable of flight; some, after flying off, soon return; while others, when the greater number have departed, finding their situation now more comfortable, choose rather to remain. But, even when almost all the bees go off, the desertion lasts but for a moment: the hive throws only during the finest part of the day, and it is then that the bees are ranging through the country. Those that are out, therefore, cannot participate in the agitation; having returned, they resume their labours; and their number is not small, for when the weather is fine, at least a third are employed in the fields at once.

Here, then, are many recruits to people what we should have thought a deserted habitation; and as the queen leaves a prodigious quantity of operative brood, which

soon transforms to bees, the population sometimes becomes almost as great after swarming as before. Thus the hive is perfectly capable of affording a second colony without being too much impaired.

The old queen does not lay in all the royal cells on the same day, at least one day intervenes, and frequently three or four. After she has left her abode with the first colony, the remaining bees take particular care of the royal cells, and prevent the young queens successively hatched from leaving them, unless at an interval of several days between the departure of each. The necessity of an unclouded sun for swarming is one reason that has induced nature to admit of bees protracting the captivity of their young queens after their final metamorphosis. Another reason is, that they may be able to fly and depart with a swarm immediately on being liberated; otherwise, like males and workers, twenty-four or thirty hours would elapse before they were capable of flight. Their confinement is always longer when there is a succession of bad weather, being sometimes protracted eight or ten days; and, when they are set at liberty, it is always according to their age, the oldest being first liberated.

It is a well known fact, that captive young

queens and those that have recently obtained their liberty, have the faculty of uttering a monotonous sound called *piping*; of which some idea may be formed by supposing the word *peep* several times repeated in rapid succession.

Sooner or later the female hatched from the first egg laid by the old queen leaves her cell; the workers then treat her with indifference, for no respect is paid to a virgin queen; but she, immediately yielding to the instinct which urges her to destroy her rivals, seeks the cells where they are enclosed; yet no sooner does she approach than the bees on guard bite, pull, and harass her, so that she is forced to remove. Sometimes, however, when she is thus maltreated, she pipes, standing, while doing so, with her breast against a comb, and her wings crossed on her back, in motion, but without being unfolded or farther opened. Whatever (says M. Huber) may be the cause of her assuming this attitude, and emitting this sound, the bees are affected by it; all hang down their heads, and remain motionless. Having thus paralyzed the bees, she again attempts the destruction of the young females; but, in doing so, she ceases to pipe, the bees resume courage, and torment her as before; and as the royal cells are numerous, scarcely

can she find a place of rest. Incessantly animated with the desire of attacking the young queens, and as incessantly repelled, she becomes agitated, and hastily traverses the groups of workers, to which she communicates her disorder. The heat becomes insufferable, sometimes rising from  $95^{\circ}$  to  $104^{\circ}$  during the tumult. At this moment the bees rush towards the aperture of the skape, and, accompanied by the young queen, forsake it to seek another habitation.

After departure of the second colony, the remaining workers set another queen at liberty, and treat her with equal indifference as the first. They drive her from the royal cells; she also, perpetually harassed, becomes agitated, departs, and carries a new swarm along with her. When a hive is very strong, this scene may be repeated, with the same circumstances, three or four times during summer. The number of bees being then so much reduced that they are no longer capable of preserving a strict watch over the royal cells, several females are enabled to leave their confinement at once; they seek each other, fight, and the queen at last victorious, remains undisturbed in the skape. A third swarm, however, is not very common, and a fourth is extremely rare.

The interval between the departure of the

first and second swarm is never less than seven days, and very seldom longer than eighteen; the average time may be from nine to twelve. Three or four days usually intervene between the second and third swarm; and the fourth sometimes departs on the day after the third.

Before closing this section, we would say a few words more regarding the piping of queens. When young queens are kept prisoners in their cells after their final metamorphosis, they invariably emit this sound. Hence M. Huber conjectures, with much plausibility, that *restraint* is the cause of their doing so. This may be one cause, but we have reason to believe that there are others, *fear*, for instance, and *a sense of uneasiness from too great heat*. We have seen that young queens, when harassed by the workers, also pipe, and that this sound has the effect of paralyzing the bees. We are, therefore, in this case at least, inclined to believe that the sound is caused by fear. But how, it may be asked, can the fear of the queen thus affect the workers? We would answer, that it may be that the workers are unconscious that the fear manifested by the queen arises from their rough treatment; on the contrary, they may ascribe her alarm to some other cause, and thus, when the sound is emitted, may they participate in the appre-

hension of danger ;—“ they all hang down their heads,” says M. Huber, “ and remain motionless.” We infer from analogy that this cowering position is assumed by the workers from an apprehension of harm. When a bird of prey appears over-head, both the turkey and the common hen, by a peculiar scream, alarm their young, and apprise them of the danger: the little animals immediately squat among the grass, and lie concealed and motionless till the object of their fear has disappeared.

But from what follows, it would appear that the faculty of piping is not peculiar to young queens, but that old ones also emit a similar sound; and it also affords evidence that either restraint, or fear, or too great a heat, as may be the case when the skape is excessively crowded immediately before swarming, will induce a queen thus to express her feelings.

An intelligent cultivator assures us, that on one occasion, having dislodged a hive, he held the queen in his hand, and heard her distinctly pipe several times. Another apiarian informs us that he has often heard piping a night or two previous to the departure of a first swarm; and also at the time the swarm was issuing forth. A correspondent, who has paid much attention to this.

subject says,—“ When the season of swarming again arrives, if you pay particular attention you will hear the same peeping before a first swarm comes off, as before a second. It is not so often heard, it is true, before a first; but the reason, I apprehend, is owing to the greater sound made by such a vast multitude of bees then composing the hive preventing us from hearing it.” With due deference to our correspondent, we would remark, that, as far as regards the piping heard previous to a first swarm, it is possible he may have been deceived, for if the departure of the old queen is retarded by unfavourable weather or any other cause, the young queens may be prevented by the workers from leaving their cells, and, in this case, the sound may proceed from them. But be this as it may, we hope what has just been said will provoke investigation.

*Virgin Swarms.*—When the season is favourable, a very strong first swarm, three weeks after being settled, sometimes throws a new colony, which is also conducted by the old queen. Such an occurrence, however, is neither very common nor desirable in our variable climate. During the first ten or eleven days after leaving the habitation in which she passed the winter, the queen lays eggs pro-

ducing workers, she then deposits a few drone eggs in cells prepared for their reception; the bees construct royal cells; and the colony so lately established itself throws a swarm.

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## CHAP. IX.

### PRACTICAL OBSERVATIONS AND DIRECTIONS REGARDING SWARMS.

*Signs of a First Swarm.*—Before a hive throws a swarm, there are certain prognostics which forewarn the cultivator of the event, and which enable him to calculate, with tolerable accuracy, the time when it will happen. We have said before that swarming depends on a superabundant population. Towards the approach of the swarming season, this superabundance is indicated by the condensed vapours of the hive, appearing on cold mornings and evenings, in the form of drops of water, on the board at the entrance of the skape. This water is commonly called *sweat*. As the time of the swarm's leaving the parent stock approaches, the water ceases to appear, and we cannot well assign any reason for this circumstance;

unless it be that the increased number of bees then fanning before the entrance, and acting as so many ventilators, waft off the vapours. Be this as it may, it is certain that these insects practice such a method of obtaining a circulation of air through their habitation. One party expels the air vitiated by the respiration, while another introduces a current of fresh atmospheric air.

The drones next make their appearance, usually about six or eight days before swarming; but sometimes much longer, and in some seasons, when there has been a succession of fine weather, first swarms will depart without a single drone, and indeed before the drones have left their cells. Such was generally the case in 1826. On the day of the first appearance of the males, and for several successive days, the working bees may be observed carrying out thin round scales of wax, which, we have reason to believe, are the covering of drone cells.

After this, should the bees begin to lie out in clusters on the front of the skape, or under the board, let the proprietor hold himself in readiness; for the first bright day, or even a gleam of sunshine after a shower, may induce the swarm to rise.

*Clustering.*—Such are the principal indica-

tions of an approaching swarm. With regard to clustering, however, it is rather a deceitful precursor; for many hives swarm without exhibiting this symptom. On other occasions a hive will sometimes lie out, day after day, for a considerable time, before it rises, and, indeed, we have known many instances in which a swarm under such circumstances did not rise at all. This clustering may arise either from a want of room, or, more generally, from the excessive internal heat of the skape.

The profit is much reduced by allowing the bees to remain idle in this manner. In order to make them swarm, raise the skape by an eke one inch deep; were it more capacious, the swarm would not, perhaps, rise at all: the skape must likewise be kept as cool as possible, by shading it from the ardent rays of the sun. The skape may even be raised on three small stones, and the space plastered up with lime. Should the cultivator already have as many hives as he wishes, it would be as well to raise the skape by an eke of the full depth; this will, in general, induce the swarm to remain, but on some occasions it will not; in either case, however, there will be no loss. A clustering stock, it is said, may be induced to swarm by placing it on a new stand a few paces from its original station.

*Swarm on the Wing.*—Bees commonly swarm on a fine, bright day, seldom or never when the sky is overcast, or during high winds. After the tokens of swarming, before mentioned, have been exhibited, the proprietor ought, especially in fine weather, to keep a constant watch from nine morning till four afternoon. To save the trouble of watching, artificial swarms may be formed, provided a skape be used that opens above, but it would be improper to attempt this with the common skape. When the swarm rises, after wheeling about in the air for a little while, the bees generally settle on the nearest hedge or bush. In this case, let no noise, no interruption disturb them; but, if the swarm seems inclined to rise high in the air, and fly to a distance, which sometimes happens, let handfuls of sand be thrown among the fugitives, which it is supposed they mistake for a shower of rain, and they will seek safety in a near retreat. The report of a gun has a similar effect.

*Skaping a Swarm.*—A swarm sometimes alights on places extremely difficult of access. If, for example, a swarm should settle on a high tree, at the extremity of a long slender branch, the method of proceeding is as follows:—let a lofty ladder be placed,

within reach of the swarm, against the branches, in a position almost perpendicular, having its foot fixed securely in a hole purposely dug. For further security, let a rope be tied to about the middle of the ladder, and passed round the trunk of the tree, drawn very tight, and made fast ; and, finally, let a person at the foot of the ladder prevent it from falling to either side. The ladder may now be mounted in perfect safety. The twig to which the swarm is attached must be cut as gently as possible, with a sharp knife, and the colony brought cautiously down.

We have been thus particular with one, as it is impossible to anticipate every case that may occur ; what has been said, however, it is hoped, may put the cultivator on the way of surmounting all difficulties. It is fortunate that what we have just supposed is an extreme case. Swarms generally alight on plants of humble growth, such being planted round every well-ordered apiary. Let us suppose the bees to settle on a branch of a gooseberry bush. Press down the branch gently to the ground, and secure it from springing up, or cut it off altogether ; then place the skape in a sloping position, over the swarm, so that one side may rest upon the ground and touch the cluster, while the other is held up by the hand, or supported by two or three

forked sticks, and the whole is to be shaded with a cloth till the evening, that the bees may not again rise. The cluster is now to be tickled with a feather or small branch to urge the bees more speedily up into the skape, otherwise they would, perhaps, not go up at all : the custom of rubbing the inside of the skape with the syrup of honey or sugar to entice the bees we deem quite unnecessary. When the bees have all gone up, place the skape on its board, carry it cautiously to the place where it is to stand, and cement it to the board with lime or clay.

*Fugitive Swarms.*—When the weather has been very fine some time previous to swarming, it is certain that a hive sometimes sends a party to spy out a commodious habitation for the colony. A vacant skape, a hollow tree, or a space about the roof of a house, especially if bees have wrought there during the preceding summer, is generally selected. Mr. Bonner informs us that at such places he has often seen a considerable number of bees busily employed in clearing away the bees which have died during winter, broken crumbs of wax, and all other rubbish ; and has sometimes observed two swarms laying an equal claim to the newly discovered habitation.

This fact accounts for the circumstance of swarms sometimes taking distant flights. Even on the day after being skaped a swarm has been known to desert its habitation, and fly to one previously selected. In such cases, the direction of the flight must be carefully observed; for a swarm always flies to its intended abode in a straight line. Let the proprietor pursue with all possible speed, taking care, however, even should he lose sight of the swarm, never to deviate from the line at first marked out, and he is almost sure of the prize.

As fugitive swarms often take up their abode in places where it is impossible to skape them after the usual manner, the owner ought to endeavour to get possession of the queen, and the bees will all follow her. Smoke will be found a very efficacious agent in dislodging a swarm that has pitched its camp in a hollow tree.

Should the line of flight lead the pursuer to some garden where there is an apiary, and if he should observe about the entry of one of the skapes a quantity of shorn, brown coloured wax, like so much saw dust, it may be presumed that the forerunners of the swarm have cleared it off the combs; and, upon turning up the skape, if the cells appear destitute of brood, it is a proof that the

present inhabitants have but lately taken possession, and is the strongest presumptive evidence that it is the swarm in question ; and, unless the person in whose apiary it is found can show proof to the contrary, it ought to be seized by the person who pursued it.

While bees are swarming, the operator has little to fear from their stings, as they are then less irascible than at any other time. Thorley has recorded an instance of one of his swarms settling on his maid servant's breast and neck ; she was, very naturally, much alarmed ; but he got the swarm safely skaped, and the maid received no injury.

*Sign of a Second Swarm.*—The time when a second swarm will come off is known with a great degree of certainty : for the young queen, some time between the eighth and twelfth day after the departure of the first colony, begins to pipe, as already mentioned, and continues doing so, at intervals, till the hive swarms. This sound, which is commonly called “ the warning,” may be heard very distinctly by listening close to the skape in the evening. At first it seems to proceed from about the top of the skape ; it is then low, and not very often repeated ; but gradually, as the time of swarming approaches,

the queen apparently descends, the note swells, and the intervals of silence are short. The swarm seldom rises the next day after the warning is given, even though the weather should be very inviting; should the second be as favourable, however, it may perhaps come off; but unless the weather is bad, the swarm will, in all probability, leave the parent stock on the third day.

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## CHAP. X.

### WEIGHT OF SWARMS.

It is an indubitable fact, that a certain number of bees forming one community, will collect more honey than the same number divided into two. Experience teaches that a hive can scarcely be too strong. There is no doubt that there is a maximum population above which a hive cannot multiply; but on account of the smallness of the stock-skapes in general use, this maximum is rarely attained. The cultivator, however, will find much of his success depend on the strength of his swarms, and in order to procure strong colonies, he must lodge his stock-hives in

capacious skapes. The capacity ought to be equal to one solid foot at least.

A weak hive is a continual source of anxiety, trouble, and expense; it collects but a scanty store of provision, insufficient for its own sustenance, is unable to defend the little that it has, and ultimately becomes the prey of robbers, or perishes through cold.

Cultivators judge from the weight whether a hive is sufficiently strong. A moderate swarm weighs from 4 to 5<sup>lb.</sup>; when less, it ought either to be returned to the mother-hive, or united with another. Some apiarians have been so fortunate as to obtain swarms so heavy as 8, 10, and even 12<sup>lb.</sup> Such swarms are, however, very uncommon, and are always thrown by remarkably strong hives that are lodged in very large skapes.

Authors differ widely regarding the number of bees in a pound weight. Butler estimates the number at 4480, Keys 4640, Wildman 4928, and Reaumur at 5366; but we are inclined to think Mr. Keys nearer the truth than any of the others: this apiarian estimates a swarm of 6<sup>lb.</sup> 5oz. 6dr. to consist of 29,280 bees, and the solidity of the cluster to be equal to 537 $\frac{1}{2}$  cubic inches, or a peck of the old Winchester measure, which is about 15 cubic inches less than the imperial peck.

These discrepancies seem to arise from the different state of the bees at the time of examination ; for it is certain that they do not always weigh alike : “ This was fully confirmed to me (says Mr. Keys) by experiments made at different times, which always varied ; but, from the average of the whole, the calculation given seems nearest the truth, at least it is sufficient for any purpose the practitioner may require.”

There is no weighing instrument so well adapted to the general purposes of the apiarian as the common spring steel-yard. It may not here, perhaps, be thought irrelevant to hint, once for all, that all the instruments and apparatus used only on certain occasions, may be purchased and held as common property by several cultivators. A steel-yard that draws out to about 60lb, will, in general, be found quite sufficient ; and may be had in any hardware shop for four or five shillings. Before being purchased, both its accuracy and its capability of being drawn out the whole length, without breaking, ought to be carefully ascertained. Immediately after the skape containing the swarm is placed on its board, let the whole be suspended from the hook of the steel-yard by three stout cords, uniting at one end in an iron ring, and having at each of the loose ends an iron

claw for taking hold of the under side of the board, the rod of the steel-yard will be drawn out and will show the total weight ; from which deduct the weight of the skape, board, and suspension tackle, all previously ascertained, and the remainder will be the exact weight of the swarm. These respective weights ought to be accurately noted down for future reference.

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## CHAP. XI.

### UNITING SWARMS.

It sometimes happens that a second or third swarm settles in two separate clusters, which shows that two queens have come off with the swarm ; but no single swarm being too large, let the branches on which they settle be cut and laid together, so that both clusters may be lodged at once in the same skape, and the queens themselves will decide upon whom the maternal duties shall devolve. When two weak swarms rise at the same time, if they do not of themselves go together, which they often do, they ought to be united in a similar manner, as weak swarms are not worthy of keeping by themselves.

Clusters, as well as weak swarms, that are to be united, frequently alight on places where it is either impossible or inconvenient to do otherwise than lodge each, in the first instance, in a separate habitation. In this case, let a cloth be spread on the ground, and lay a stick across it; set one of the skapes upon the stick, and, by giving a smart blow on the top, all the bees will fall down upon the cloth; the empty skape is then to be thrown aside, and that which is to be the future habitation of the united community placed over the bees, and they will all ascend and form one family. Others, instead of striking the bees down upon the cloth, place, with its bottom upmost, the skape in which the united swarms are to live, and strike the bees of the other skape down into it. The more they are jostled and disturbed, there is the less danger of warfare.

It is well known that many hives are so much weakened by the departure of swarms, that they often perish in the course of the ensuing winter or succeeding spring. It is therefore advisable, immediately after the flight of the first swarm, to give the bees more room, which is the most likely means to prevent the departure of a second colony. A third swarm is always a positive loss.

Notwithstanding all our endeavours to in-

duce the bees to remain together, they sometimes come off; but if the apiarian has the address to seize the queen, at the moment she is leaving her abode, the bees, on missing her, will all return. Should she pass unobserved, however, the swarm must be skaped as on ordinary occasions, and in the evening returned to the parent stock, in the manner directed for uniting swarms.

Some allege that the bees of one hive distinguish those of another by the sense of smell, and urge in proof of this, that when the bees of two hives are fumigated or drenched with a syrup of small beer and sugar, the same odour being thus communicated to the whole, they unite peaceably. This, we apprehend, is ascribing the effect to a wrong cause. The advocates of this doctrine, it would appear, take it for granted that each hive has an odour peculiar to itself; but we would ask, if all hives have not the same odour, in what does the difference originate? It is unnecessary to waste our time in refuting this fanciful doctrine, it is unsupported by analogy; the species and sex of the combatants are the same, they subsist on the same food, live in contiguous habitations, and these habitations are constructed of the same materials. In short, we are inclined to impute the friendliness of the union, not to

any similarity in smell, but to the stupifying perturbation, occasioned by the fumes or the liquid, affecting for a time the instinct of the bees. But, "satisfied with facts, let us avoid speculation." Whatever be the cause it is an established truth, that when these insects are greatly agitated, either by rapping on their skape, or by applying smoke or a liquid, they lose their irascibility and their hostile spirit, and will then unite peaceably. As soon, therefore, as two communities are put together, let a considerable quantity of smoke be blown into the skape, and all danger of warfare will be obviated.

A pretty effectual method of applying the smoke is that adopted by those roguish urchins, who go about on evenings with burning tow in a hollow cabbage stem, and set all their village a-coughing, by blowing the smoke out of these rustic tubes, into the houses, through the key-holes, or other opening in door or window.

In uniting hives, we use a fumigating box of tin, of the form of which we cannot give a better idea, though rather a ludicrous one, than supposing it an old shoe, with a hole in the toe, and a spur on the heel; the mouth of this shoe, moreover, is covered with a hinged lid. The spur is a tube communicating with the interior, for receiving the pipe

of a pair of common hand bellows, the blast of which drives the smoke forward through the hole in the toe into the skape. The burning rags, or other material, for producing the smoke, lies directly under the lid, and a piece of moveable, perforated tin is put in near the mouth, so as to intercept the sparks which would otherwise be emitted, and burn the bees or melt the combs. This fumigating box is ten inches long, and three broad; it is two inches deep at the heel, and tapers gradually down to a quarter at the toe. It is to be particularly attended to in the construction, that there be as few joinings as possible, and these are to be fastened with rivets instead of solder.

On no occasion are the advantages attending the union of two communities more apparent than when one of the hives has lost its queen, for if there be neither eggs nor brood in the cells, the hive would inevitably come to ruin. It is true, indeed, that another queen might be substituted by the cultivator, in her place; or he might supply the desponding community with the means of rearing another queen for itself, by taking a piece of comb, containing the eggs of workers or young larvae, out of another skape, and putting it into theirs. But unless there were drones in existence to impregnate the

young queen such a proceeding would be of no service, as she would remain barren. The only resource, then, at certain seasons, is to join the unfortunate hive to one that has a queen.

A hive may be known to have lost its queen, without the means of raising another, by some of the following symptoms.—When the drones are allowed to live long after they have been destroyed by every other hive ;—when the bees are pretty numerous, and yet do not carry while those of other hives are quite busy ; or, if one now and then does enter half loaded, it soon returns with the balls still on its legs, creeps about, and again takes wing. The bees on returning after an excursion, do not testify their joy, as they would otherwise have done, by vibrating with their wings at the entrance ; for bees thus express, not only their agreeable, but also their disagreeable sensations. When a hive wants a queen the skape grows lighter every day, the bees crowd listlessly about the entrance, and if the hive has been above twenty days without a queen, upon searching for brood in the cells, they will be found quite empty.

## CHAP. XII.

## ON FEEDING.

The heath honey-gathering commonly ceases about the middle of September. The quantity of honey accumulated by each of the hives ought then to be ascertained, that the proprietor may know whether any of them require feeding. This he will be enabled to do with sufficient accuracy, by deducting from the gross weight, that of the skape, board, suspension tackle, and swarm when first lodged, as already directed when speaking of the weight of swarms. A trifling allowance must also be made for the weight of the combs and farina.

An ordinary hive consumes eight or nine pounds of honey from the middle of September till the end of February, and as much more from that time till the beginning of June, the commencement of the honey season; consequently 16 or 18<sup>lb</sup> are required in all, and hives having so much are said to be *stock-weight*. Nevertheless, it is not to be disputed, that a hive having only eight or nine pounds of honey in the fall, may, with proper attention to feeding, provided the

skape be nearly full of combs, prove a good stock, and swarm in the ensuing summer. Such light stocks are, however, always precarious, and ought to be rejected when better ones can be obtained.

When a stock-hive in the middle of September is found to have less than eight or nine pounds of honey, food ought to be administered every day till the end of the month, but no longer, unless the weather keep mild, and necessity urge, for the temperature of the atmosphere then diminishes so much that the bees cannot fly abroad to ease their bodies, and, if fed, they are forced to retain their feces so long that some corruption ensues ; their excrements, which, in a healthy state, are of a reddish-yellow, become black and fetid ; if their confinement is protracted for three or four successive months they lose the faculty of retention altogether, they are seized with a dysentery or looseness ; their own bodies, the combs, and the board, are soiled by the black filth, and the population is greatly reduced by the ravages of the distemper. Fine weather, however, effects a cure. On the first mild day the bees leave their habitation in great numbers, circle the air in all directions, and ease their bodies while on the wing, and in the evening express their comfort by a loud

and cheerful humming. Some authors mention other diseases than dysentery, to which bees are subject ; they confess, however, that they are of rare occurrence, and are not fatal in their effects ; but, though we are far from discrediting the statements of others on this point, we frankly acknowledge, that no other disease ever came under our observation.

There is not a better method of making up a great deficiency of a stock-hive, than to supply it with the requisite quantity of honey-comb. Let us suppose the hive to be lodged in a straw skape of the common fashion : in this case, it is to be placed above what is called an *eke*, of the same material and diameter as the skape itself. The combs are to stand in the eke, in their natural position, upon two or three rods running at right angles ; and are to be kept in their places, and at proper distances by slender splits of well seasoned briar thrust through the rolls, and passing along from side to side in the spaces between the combs.

When a hive is supplied with honey combs in September, the eke ought to remain as many weeks as there are pounds, and if the skape is large it may then be taken away ; but if small, it will not be amiss to let it remain altogether. “ This method (says Mr.

Bonner) may be practised at all seasons of the year, and it has this additional advantage, that it may be executed at little expense, and occasion a saving of all the honey in the old combs that will not run out, or that happens to be mixed with the bee-bread, eggs, or young bees."

The stocks, we have said, ought to be weighed in September; and we must here urge the necessity of again weighing them in February; because shortly after this, it will be impossible to form any judgement how they stand with regard to provisions, for the queen then begins to deposit her eggs in considerable numbers; and, on account of the continual multiplication of young in the cells, the weight gradually increases, while in fact the hive may be on the verge of starvation. Indeed, the rapid increase of the population during March, April, and May, greatly increases the consumpt of the store of honey, and as little or none is then to be procured exteriorly to the skape, let the cultivator beware lest his stocks perish on the very eve of the honey season. On the return of spring, therefore, those hives that are in want of provisions must be assiduously and regularly fed with liquid honey or syrup of sugar, always regulating the

supply by the number of bees and the temperature of the atmosphere.

Even hives that are not actually in want are greatly benefitted by receiving a little food twice or thrice a-week, from about the middle of April till they cease to accept of it, which they will do, as soon as honey becomes abundant in the pastures. Food ought to be again offered, however, on a return of unfavourable weather ; and this is to be particularly observed with regard to swarms recently lodged. “ The bees are faithful stewards,” says Mr. Bonner, “ and will not fail to repay their master’s generosity with usury.” We have the concurrence of Mr. Huish also on this point :—“ Some apiarians (says he) conceive that the feeding of bees renders them lazy and inactive. On what this opinion is grounded, I am at a loss to conceive ; for it is in direct contradiction, not only to my own experience, but also to that of many other apiarians. I consider that a little food granted to even a very populous and well provisioned hive in the spring, is attended with very beneficial consequences. It bestows life, animation, and vigour, throughout the whole community ; it accelerates the breeding of the queen, and consequently conduces to the production of early swarms. I invariably give all my hives

some food in the spring, and I can recommend the custom with the greatest certainty of its propriety to every keeper of bees."

Of all substances for feeding bees, none is equal to honey or sugar made into a syrup with boiling water. This syrup ought not to be quite so thick as honey, and more should not be made at once than is required for present use, as it is apt to candy and ferment.

The best method of administering the food is in a trough, having a thin wooden float, on which the bees may stand in safety, and imbibe the liquid through small holes made in the float for that purpose. When the combs do not reach down to the board, the trough is usually inserted at the entrance; but should such obstacle be opposed, the skape is placed upon what is called a *feeding-board*, having a groove in its upper surface that the trough may lie *flush*, as tradesmen would say. But as this feeding apparatus is well known, it seems unnecessary to enter more into detail, especially as we are about to describe a feeding-trough of an improved construction, and which is less expensive on account of being used with the common board.

The great objection to the common method of feeding is, that, although the bees, during

the night, take the whole of the food given them, the smell of it, nevertheless, on the succeeding day, emanates from the trough; and even though that were removed and a piece of clean wood put in its place, still as it is almost unavoidable to slide in the trough without spilling some of the syrup, the objection is not obviated; hence strange bees are attracted by the odour, and the consequences are frequently ruinous. The common feeding-board, in short, is inconvenient, unnecessarily expensive, and, moreover, when it is used, the skape cannot be kept so close and warm as it ought to be.

Before describing the improved feeding-trough, it may not be amiss to inform the reader that we have seen two different descriptions of it, namely, one in "The Edinburgh Encyclopædia," and the other in "The Glasgow Mechanic's Magazine;" the principle of both, however, is the same, and we would offer a third modification, less complicated, and therefore less expensive than any of the other two, qualities absolutely necessary to its being generally used.

This trough or box, then, is constructed of the best fir wood, and is nine inches long, three broad, and two deep, all inside measure. It has a moveable glass lid of one or more pieces let into a *half-check*; and as it

stands on the outside of the skape, across the flight-board, with its side about half an inch from the entrance, there is an opening three inches long, and half an inch deep, cut out of the middle of the upper edge of one of its sides, by which the bees enter between the glass and the float. The space between the box and the entrance of the skape, as much of it at least as is necessary, must be covered in by three small pieces of wood, that the bees may not be annoyed by wasps, and robbers of their own species; indeed it will be found best to have these pieces of wood fastened to the feeding box. (See the Plate.)

The food is to be administered in the evening, and the box removed in the morning, and it is advisable to lay a loose board or a slate over the glass, both to preclude light and ward off rain.

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## CHAP. XIII.

### ENEMIES OF BEES.

The enemies of bees, according to some writers, are pretty numerous :—ants, spiders, snails, wood lice, called *sclaters* in Scotland,

toads, frogs, swallows, sparrows, and common poultry, are all enumerated among their foes; but the harm done by any of these is certainly very trifling.

The large nocturnal insect called the death's head hawk-moth (*Sphinx atröpos*, Linné,) is a very formidable enemy to bees. In the caterpillar state it feeds on potato leaves, and appears on the wing in mild nights during September, when, from its size, it is often mistaken for the bat; indeed that little animal was blamed for the ravages committed by the sphinx till M. Huber, with his usual sagacity, discovered the true enemy. It is fortunate that this insect is rare in Britain, especially in the northern parts of the island; it is always advisable, however, to adopt the precaution of using skapes with a very low entrance. Both M. Huber and M. Lombard affirm that when a hive begins to suffer from the attack of the sphinx, if the entrance is not such as to prevent the access of their enemy, the bees themselves form a very curious and effective barricado with a mixture of wax and propolis. M. Huber, in the *Bibliothèque Britannique*, has given a drawing of an apian fortification.

Old combs and those of weakly hives are sometimes infested by the larvae of moths,

which live upon the heterogeneous matter that abounds on old combs. The insect in the perfect state, effects a surreptitious entrance into the skape, and lays its eggs on the combs which are most distant from the centre, where they are hatched. The best method, therefore, of checking the depredations of the moth, is to remove the outside combs; and, as it is always those that are old and foul that are attacked, no stock-hive ought to be kept longer than two years without a complete renewal of all the combs.

During winter, when the bees crowd together in the centre of their habitation, mice not unfrequently enter, and commit terrible ravages. In order to obviate such a calamity the entrance must not exceed five sixteenths of an inch in height. Straw skapes, even when the aperture is sufficiently low, are not proof against these little thieves, for they have been known to effect an entrance by gnawing a passage through the rolls. "As the mouse (says Mr. Huish) is the principal enemy in winter, every method should be taken for its destruction. I keep constantly round my apiary some traps of the following construction. Let a pea be soaked in water, then draw a thread through it, and tying a stick at each end, place them in the ground, the exact distance of the width of a brick;

the brick is then placed on the thread, and the mouse coming to eat the pea, gnaws also the thread, and the support of the brick being then taken away, it falls and kills the mouse."

Wasps have been known from all antiquity as dreadful enemies to bees; they are most troublesome in the neighbourhood of plantations, commencing their attack upon the weakest hives about the end of August, and their onset is sometimes so furious that the rightful owners have been known to yield their habitation to the invaders. The best time to destroy wasps is when gooseberry bushes come into blossom; great numbers of the females then frequent the bushes, and every one that is then killed effects the destruction of a whole colony in embryo. Their nests ought to be carefully destroyed, if in the earth, by pouring water down their hole, or kindling a quantity of straw or brush wood around them; and when they are found on trees, they may either be fired or blown up with gun powder.

When a hive is attacked by wasps, the entrance of the skape ought to be contracted by laying a piece of wood on each side of it, with a third piece lying above as a cover to the passage or *defile*, formed between the ends of the pieces. Each of the two pieces

of wood is two inches long, one inch thick, and half an inch broad. By means of this simple contrivance, the entrance may be widened or contracted at pleasure. Some place bottles of sweetened water in their apiaries for the purpose of entrapping the enemy; vast numbers are thus destroyed; but by this method, the voracious insects are attracted by the smell of the liquid to the very place where they are the least welcome; whereas, were the bottles suspended in the nearest plantations, a greater number would perish, and the bees would be less annoyed.

: But of all the enemies of bees, none make such havoc as robbers of their own species. A weak hive is sometimes absolutely ruined in a single day; and, at certain times, it requires great prudence and precaution to avert such misfortunes. One method of doing so is, to make all the stocks as nearly equal in point of numbers and riches as possible. A poor hive robs from necessity, and ought to be fed; while one that is rich and powerful seizes the property of its less fortunate neighbour, because it can do so in comparative security. Another method of securing a hive from invasion is to guard the aperture of the skape by the defile recommended when bees are suffering from wasps. Let it be set no wider than what

may be found absolutely necessary, and such a dangerous pass will thus be presented to the enemy, that, it is more than probable, they will desist from their hostile attempt.

Notwithstanding the above precaution, however, should the attack be renewed on the following day, the proprietor ought to shut up his bees in the evening with a perforated tin shutter, or in such a way as to allow them fresh air, and remove the colony to a dark chamber, there to remain all the ensuing day. An empty skape is to be set where the full one stood, to divert the attention of the robbers from attacking any other hive, and, thus disappointed, it is likely they will cease to return, when the assaulted colony may again be set in its proper station. But of all others, the most effectual precaution is to remove the hive that is the object of attack to a distance of one or two miles.

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## CHAP. XIV.

### OF THE APIARY.

In the establishment of an apiary, the principal requisites are, that it be well sheltered from wind, and conveniently situated

for watching during the swarming season. The situation, it is true, with regard to pasture is of the first importance, but a choice in this respect is, comparatively speaking, within the reach of few. With a proper degree of care and attention, however, bees prosper in situations apparently very unpromising, and there are few cottage gardens in Britain where they might not be kept with advantage.

The skapes ought to stand on the sunny side of a wall or hedge, as far distant from each other as circumstances will allow: for when placed too close, the bees of one hive are apt to annoy those of another. Notwithstanding this, some, whose room is limited, place their skapes so near each other as one yard without experiencing very prejudicial consequences.

In most places where the culture of bees obtains that attention which it so well merits, the skapes are kept in shades or *bee-houses*. This is doubtless a most excellent practice, and, when the shades are of a proper construction, cannot be too warmly recommended. Those in common use, however, lose most of the advantages which they ought to possess, by being open in front. A bee-house ought to be so fashioned as to secure the skapes from thieves, to shield

them from rain, and from the extremes of heat and cold ; for the heat sometimes melts the combs, and the bees are drowned in their honey, while the cold, during severe winters, candies the luscious store, and renders it useless to them. We have already hinted that the great internal heat of a skape, previously to a swarm's issuing forth, has the effect of forcing the bees to lie out in idle clusters, and it must be evident to every one that when the sun shines upon the skape the evil must be greatly augmented, and we are induced to think so, because we have observed that stocks under shade of a proper bee-house seldom lie out all the day, and even when they do, it is uniformly both for a short time and in small numbers.

We have shown why skapes ought not to stand too near one another in the apiary, but this is almost unavoidable when they are under cover of a shade of the usual construction. Instead of several skapes being placed in one bee-house, we would recommend that each should have a separate covering.—Let four stakes be firmly driven into the ground so as to form a square round the skape, rising as high as its top. Seven or eight inches from the ground, let four cross bars be nailed to the inside of the stakes quite round the square, and let the floor or

rest for the board of the skape be fastened to these cross bars. The stakes are to be connected at the top in the same manner as below by four cross bars. All the spaces between these transverse bars are to be guarded by others running slantly between opposite corners. The diagonal bar on the top, as well as that on the front or back, whichever may be found the more convenient, is to be moveable, being fastened at one end by a simple staple-hinge, and both bars are to meet at the same top corner, and be fastened to the same staple by a padlock. A straw rope wrapped tightly round the whole frame renders the shade complete. If a frame of this kind be made either of cast or of malleable iron, and the corner posts fastened with lead into a large flat stone, the difficulty of depredation will be very greatly increased.

The appearance of the frame just described, enveloped in straw, may be deemed by one man rude and unsightly, while another, on the contrary, may be pleased with its rural roughness and simplicity. The tastes of men are proverbially different. Let him who dislikes straw substitute boards; and, indeed, were it not for the expense, the latter is less exceptionable than ropes, espe-

cially when straw skapes are used, on account of being proof against mice.

Various methods have been contrived to secure the property of the apiarian from being carried off by thieves; the following we think pretty effectual:—The support of the skape is of malleable iron, having a single stem below, but parted into three, or rather four, branches above; on the top of which branches the board of the skape rests. The lower part of the stem is fastened with lead into a large shapeless stone, sunk to a level with the surface of the ground. A piece of hoop-iron passes over the top and down the sides of the skape as far as the under side of the board, in which notches may be cut that the iron may lie closer. A chain, fixed to one leg of the iron, is passed once round the support at the root of the branches, and the end of this chain is fastened with a padlock to the other leg. But in this state the fastening might be slipped off at the crown of the skape, and the thief thus obtain his booty. To prevent this, one or more hoops, surrounding the skape, must be rivetted to that passing down the sides.

Before concluding this chapter we may mention that some cultivators have kept their bees in garrets and in out-houses, and have reaped ample profits. A flat pipe, as a pas-

sage for the insects, connects the entrance of the skape with a hole in the wall, the roof, or a window. Mr. Bonner, whose memory is so justly revered by apiarians, "long laboured," says a writer in the *Edinburgh Review*, "under a very peculiar and almost incredible disadvantage, that of residing in the midst of a populous city; for we understand it to be a fact, that his apiary was for some years kept in a garret in Glasgow."

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## CHAP. XV.

### OF APIAN PASTURE.

In most places in Britain there are abundance of flowers during summer and the greater part of autumn. "In summer, (says the *Spectator*) the whole country blooms and is a kind of garden." The early part of spring is, therefore, the only critical period for carrying on a stock of bees, as there are, comparatively speaking, but few flowers, either wild or cultivated, at that season.

On the return of spring, the queen begins to deposit her eggs in considerable numbers, and on the first mild day of February the

bees roam abroad in quest of those flowers which yield the farinaceous food of their young. It, therefore, becomes the duty of the cultivator, where a sufficiency of those flowers is not afforded spontaneously to propagate in his garden, and even, where circumstances permit, in its vicinity, a plentiful supply of those plants, the flowers of which experience has taught to be grateful to these insects.

Yellow and purple crocuses, with a small proportion of snowdrops, ought to be copiously propagated, and, if planted in rows, take up little room. The seeds of furze and of broom may be disseminated on the sandy banks of rivulets, and on spots and outskirts otherwise barren. The sides of ditches and moist lands may be turned to good account by planting them with that species of willow called salallows; it is used for hoops and in coarse basket-work, and the bees will be greatly enriched by the employment they find on the yellow catkins while other flowers are yet scarce. In situations where greens or turnips are allowed to flower, which they do early and continue long in blossom, they afford both honey and farina in great abundance. The blossom of gooseberry and currant bushes, especially the former, is of infinite service to bees, being the first source

whence honey is procured in the spring, and when these bushes are planted around the apiary either separately or as a hedge, they not only furnish food to the bees, and afford the means of skaping swarms with facility, but are even valuable on account of their fruit.

All the flowers we have yet enumerated blow before the middle of May, and some of them as early as the bees can venture abroad. Between the middle of May and the first of June, broom, sycamore, (*plane-tree* of Scotland,) wild mustard, yellow and white clover, thyme, and hundreds of others come into blossom, when the cultivator's anxiety, with regard to pasture, is for a season happily at an end.

All the pasture just mentioned, with the exception of common garden-thyme, for we allude to that species, is afforded in profusion without any care on the part of the apiarian; and therefore it is quite unnecessary to cultivate flowers expressly for bees at such a season. Thyme, however, is a great favourite with these insects, and ought to be universally used as a walk-edging in every apiarian's garden. In any other way we would not advise its culture.\*

\* Thyme may be propagated by parting the roots about the end of March; but a speedier method of propagation is

About the end of July the white clover, which for two months is the delight of the bees, begins to fade, and, where the apiary is farther removed from heath than one mile, the skapes gradually diminish in weight every day after the first week of August. The cultivator, however, who is so far removed from heathy ground as to render it impracticable to convey his bees thither, has it in his power to keep up a succession of pasture by sowing mignonette on those small vacant spots and corners which unavoidably occur in every garden. It may also be sown as an edging to temporary walks. A considerable quantity may be sown about the middle of April, from which abundance of seed may be gathered for sowing next season. But the principal supply for August and September may be sown about the beginning of June. There is, perhaps, no flower which more eagerly engages the attention of bees than mignonette, and the honey it affords is surpassed by none.

to sow the seed at that time upon a bed of light earth, observing not to bury it too deep, which would cause it to rot. The plants will be quite ready for their final destination next spring. In order to save the seed of thyme, which ripens in July, it must be taken without delay, as the first rain would wash it all out of the husks.

*Fresh Pasture.*—There are few places so happily situated as to afford a sufficiency of pasture for bees alike during spring, summer, and autumn; the low country has the advantage in the early part of the season, and the upland districts and mountains in autumn.

The extreme distance to which bees fly for food cannot be easily ascertained. Mr. Huish informs us that he once observed bees busily employed on heath on the Isle of May, which is farther than four miles from any other land, while not a single hive of bees was kept upon the island. However this may be, it is well known, that, after the first week of August, when the white clover and other flowers of the low grounds are decayed, hives cease to improve though situated only one mile and a quarter from an abundance of heath, and if the distance is two miles, their weight diminishes rapidly, while those placed beside this rich pasture on the first of August, in ordinary seasons, make an addition to their weight of from 15 to 30lb. by the middle of September.

The profit accruing from the removal of bees to the vicinity of heath is now, in most places, duly appreciated. It is proper to mention that the place to which bees are taken ought not to be less than two miles from their former station, otherwise many of

them would return to it, and would inevitably perish.

It will readily suggest itself to any one in the least acquainted with bees, that the night time is the most proper for changing their situation. The manner of removal depends, in a great measure on the length of the journey, and the number of skapes to be transported. A man may carry a light one on his head for a considerable distance; and by fastening one securely to each end of a pole, to prevent the possibility of slipping off, he may remove two at once. But the safest method of conveyance for a few skapes, is to carry them on a light hand-barrow between two persons, using shoulder-belts that their strength may be properly applied.

The skapes must be tied firmly down to their boards, and the entrances stopped with a perforated shutter of wood or tin, or with a piece of gauze cloth, that there may be a free admission of air. When bees are conveyed from one place to another great care must always be taken that they are not suffocated; we have known excellent hives destroyed through carelessness in this respect; indeed the strongest hives are aptest to suffer.

On one occasion, being extremely solicitous for the safety of our hives when trans-

porting them, during the night, on a handbarrow, we had adopted the precaution of using very thin gauze to prevent the escape of the bees : but after having proceeded about two miles on our way, on halting to recruit our strength, we found that the gauze of one of the skapes had not been properly secured, and that, in consequence of this, the bees were at liberty. We were yet upwards of a mile from the place of our destination ; but, in this state, we proceeded, and not a single bee left its habitation. Since that time, when transporting our bees on a barrow, we have allowed them perfect liberty, and have taken no other precaution than that of waiting till ten or eleven o'clock at night before starting with our burthen.

When either the distance is great, or many skapes are to be removed, horse carriage must be resorted to. A spring-cart is to be preferred ; but, when that cannot be procured, they may be transported with safety in a common one, by laying them on a thick layer of straw, and travelling on the smoothest parts of the road.

For the safety of the comb, cultivators, especially those who use straw skapes of the common construction, sometimes place their skapes in the cart in an inverted position, and, to avoid the danger of suffocation, some

adopt the following precaution :—The same evening on which the bees are to be removed, when they are all returned to their habitation, the entrance is closed, and a coarse thin cloth is drawn through between the skape and its board, the corners and edges of the cloth are turned up and bound to the skape with a packing thread, so that the bees may not escape. When the combs are fixed to the board, they must be separated from it by passing a wire with a cross handle at each end, between it and the skape, previously to drawing in the cloth. This plan, however good during fine weather, is inadmissible when it rains ; but a little foresight will determine the course to be pursued.

Let it be pressed upon the attention, that, when horse carriage is employed, too much caution cannot be used to prevent the bees from escaping ; as they might sting the horse, and the most distressing events might follow. To avoid such risk, and for other reasons, water carriage is to be preferred, where it can be obtained.

## CHAP. XVI.

## OF SKAPES.

Skapes are, in general, constructed either of wood or straw, and in some countries bees are lodged in earthen vessels. In any of these they will carry on their operations with equal success ; pottery ware, however, from its brittleness is scarcely admissible, and cultivators who have their skapes to purchase, will, we believe, find those made of boards, when of a suitable construction, much preferable to those of straw. We ourselves give a decided preference to wood ; and, in support of our decision, it may not be amiss to state the opinion of Mr. Bonner on this part of our subject.—“ Single box hives, (skapes,) when properly made, (says he) answer very well, and when painted, last long.—They have several advantages above straw hives : They are quite cleanly and always stand upright ; they are proof against mice, and are cheaper in the end than straw hives ; for one box will last as long as three of them. I have known many bee-masters, who never used any other kind of hives, and whose bees

thrive very well. I believe, however, they are rather colder in winter, but a proper covering will prevent all danger from that quarter. But straw hives are easiest obtained at first, and have been used and recommended by the most of bee-masters."

Boxes are objected to as being too hot in summer and too cold in winter ; be it so, in this case let a hay or a straw rope be wound closely and tightly about them, or let them be set in bee-houses, any of which precautions will completely obviate the objection. This is a little more trouble it is true, " but we are yet to learn the branch of good management, which can be executed with as little trouble as is sustained when the system is slovenly and improvident."

As to straw skapes being easiest obtained at first, as Mr. Bonner alleges, may be so far true, when the cultivator fabricates them for himself ; but when purchased, they are very little cheaper than the wooden skapes used by us ; the boxes themselves are indeed dearer, but the boards on which they stand are not more than one third of the price of those required for straw skapes ; so that the first cost of each kind is pretty nearly equal.

The requisites of a skape for practical purposes are, that it afford proper shelter to its inmates ; that its construction be such as to

allow those combs stored with honey to be at any time taken, without injuring those that are empty or contain brood; that it present, in short, the means of performing all the necessary operations with facility; and that it be both cheap and durable.

*Scape Recommended by M. Bonnet.*—For the interesting purpose of observation there is no scape yet invented equal to that recommended by the celebrated French philosopher M. Bonnet, and used by M. Huber. This naturalist in his first letter to M. Bonnet says,—“Glass hives, constructed after M. de Reaumur’s principles, are of a form unfavourable to the observer, because their width allowing the bees to build two combs parallel, whatever passes between them is concealed from his view. Long experience of this has induced you to recommend hives much flatter or thinner; the panes of which should be separated by so small an interval, that only a single row of combs could be erected between them. From having felt the same inconvenience, I have profitted by your counsel in providing hives reduced to an inch and a half in width, wherein swarms have been established without any difficulty. Here, however, the charge of constructing a single comb must not be committed to the

bees: they are taught by nature to make more than one, and all parallel to each other—a law from which they never derogate, unless when constrained by some particular arrangement. Therefore, if left to themselves in these flat hives, which cannot admit of two combs parallel to the plane of the sides, they will form several small ones perpendicular to it, and in that case all will be equally lost to the observer. Thus previous dispositions become essential for the direction of the combs. I so contrived that, while they were built perpendicular to the horizon, the lateral surfaces should be three or four lines\* from the panes constituting the sides of the hive. This distance in allowing sufficient latitude for the motions of the bees, prevented them from collecting in too large clusters on the surface of the comb. By such precautions, they were easily established in very thin hives, where they pursued their labours with the same assiduity and regularity; and every cell being exposed to view, none of their proceedings could be concealed.”

It is to be regretted that M. Huber has not given us any other dimension of Bonnet's skape than the width, which is an

\* There are 12 lines in one inch.

inch and a half; but its surface must have been considerable, probably about three feet square; and it would certainly add to its convenience to have it divided, from top to bottom, into three or four apartments, by wooden partitions, having ten or twelve small holes in each as passages of communication. Each apartment ought to have its own glass doors sliding from the top in grooves, so that admittance may be had to the interior of any apartment at pleasure. The whole must be covered to exclude the light.

“It is true,” says M. Huber, our great master in apian science, “that by compelling these insects to live in a habitation where they could construct only a single row of combs, I had in a certain measure, changed their natural condition, and this circumstance possibly might have affected their instinct. Therefore, to obviate every objection, I invented a kind of hives, which, without losing the advantages of those very thin, at the same time approached the figure of common hives where bees form several rows of combs.”

*M. Huber's Skape.*—The skape invented by M. Huber, and which he calls the *Book* or *Leaf-skape*, is composed of several thin frames, placed side by side, each frame, like

those already described, being capable of receiving only one comb. None of the frames are glazed ; but two panes each fixed into a wooden frame, close the skape at each end, and these should be darkened by a moveable cover, which will also be useful in protecting the skape from the influence of the weather. M. Huber, in his "New Observations on Bees," describes this skape as being composed of twelve frames, each "a foot square, and an inch and a quarter broad ;" but it is probable that he had afterwards found it more convenient to diminish the number of frames and increase their height, as Mr. Huish informs us that it consists of eight frames instead of twelve ; that the height of each is eighteen inches, and breadth twelve, outside measure ; within the height is seventeen inches and breadth ten. This we consider a great improvement. Each frame has two cross bars besides that forming the top, namely, a square one, half an inch thick at an inch from the bottom of the uprights, and another half way between that and the top, of about three quarters broad, and three eighths thick. The frames must all be nicely adapted to each other, and kept closely united by outside bars secured by pins.—As an entrance for the bees, we would recommend, that, in the leaf-skape they should

enter under the floor-board, and, passing along an inclosed passage, ascend through a hole in the board just within the front of the skape.

Thus have we given a description of two skapes adapted to observation. An objection was brought against the first of these, namely, that by allowing only one row of combs to be constructed, the instinct of the bees might thereby be effected; but this evil is imaginary, for M. Huber, speaking of book or leaf-skapes, says, "In these I have repeated all my observations, and obtained exactly the same results as in the thinnest. Thus, I think, already to have obviated any objections that may arise concerning the *supposed* inconvenience of flat hives."

A skape, occupied by a hive under experiment, ought seldom to stand in the open air. It ought rather to be placed at a window in a house, where the apiarian may sit and observe his bees with much more pleasure and convenience than he could possibly have in the open air. For this purpose, a proper opening must be made in the under part of the window as a passage for the bees. Should the insects at any time, either by accident, or in the course of operation, find their way into the apartment, the window must be opened, and they will fly out and return by the usual entrance.

One of the most singular and valuable properties of the two skapes just described is, that on opening them, no stings are to be dreaded. M. Huber ascribes the tranquillity of the bees to the manner in which they are affected by the sudden introduction of light; then they appear rather to testify fear than anger. Many retire, and entering the cells seem to conceal themselves. This conjecture is confirmed by their being less tractable during night, or after sunset, than through the day. Thus we must open the scape while the sun is above the horizon, cautiously, and without any sudden shock, taking care to wound none of the bees. If they cluster too much on the combs, it is necessary to brush them off with a feather; and breathing on them is to be anxiously avoided. The air which we expire seems to excite their fury, for if bellows are used they are rather inclined to escape than to sting.

We, in general, prefer a natural to an artificial swarm; it may happen, however, that the apiarian, in the course of his experiments, may find such necessary; and as the leaf-scape is well adapted to their formation, we shall here detail the method in M. Huber's own words.

“ Since bees, according to Schirach's discovery, can procure another queen after

having lost their own, provided there be workers' brood in the combs not above three days old, it results that we can produce queens at pleasure, by removing the reigning one. Therefore, if a hive (skape) sufficiently populous be divided into two, one half will retain the old queen, and the other will not be long of obtaining a new one. But to insure success, we must choose a propitious moment, which is never certain but in leaf-hives. In these we can see whether the population is sufficient to admit of division, if the brood is of the proper age, and if males exist or are ready to be produced for impregnating the young queens.

“Suppose the concurrence of all these conditions, the following is the method to be pursued. The leaf-hive is to be separated through the middle without any shock,” and two of the panes which serve to close the skape “insinuated between the halves, which, when exactly applied to each other, are close on the outside. The queen must be sought in one of the halves, and marked to avoid mistake. If she by chance remains in the division with most brood, she is to be transferred to the other with less, that the bees may have every possible opportunity of obtaining another female.”

The division wanting the queen must be

placed upon a separate board, the entrance closed, yet so as to admit air, and the whole carried into a dark chamber of moderate temperature. When all circumstances are favourable, the bees, after two or three hours' agitation, will begin the same day to labour in procuring another queen. The bees must be kept prisoners for at least twenty-four hours, when the skape may be again returned to the apiary, and the bees set at liberty. In ten or fifteen days after the operation, the young queen will be hatched ; she soon issues forth to seek impregnation, and in two days commences the laying of workers' eggs, when the success of the artificial swarm is insured.

Another advantage attends M. Huber's skape, namely, that " bees may be forced to work in wax, or, which is the same thing, to construct new combs. To accomplish the object, it is only necessary to separate those already built so far asunder that they may construct others in the interval. Suppose that an artificial swarm is lodged in a leaf-hive, composed of four divisions, each containing a comb, if the young queen is as fertile as she ought to be, the bees will be very active in their labours, and disposed to make great collections of wax. To induce them towards it, an empty frame or division must be inserted between two others, each

containing a comb. As all the frames are of equal dimensions, and of the necessary width for receiving a comb, the bees having sufficient space for constructing a new one in the empty division introduced into the hive, will not fail to build it, because they are under the necessity of never leaving more than a third of an inch between them. Without any guide, this new comb will be parallel to the old ones, to preserve that law which establishes an equal distance throughout the whole surface." The number of vacancies left must be proportioned to the strength of the swarm, and the goodness of the season ; but an artificial swarm that was at first lodged in four divisions ought not, during the first year, to be forced to fabricate more than other four combs.

*Common Straw Skape.*—The skape in common use is too well known to require any description ; but the manner of depriving the bees lodged in it of their honey without taking away their lives merits particular notice. This operation is termed *deprivation*, and is performed about the end of July or the beginning of August, when the flowers of the valleys are hastening to decay, and when, therefore, the hives could not any longer add to their store. Instead of adding,

indeed, or even remaining stationary, there would be a gradual diminution, and hence the propriety of seizing at this juncture, the contents of the skape.

But though we appropriate to ourselves the produce, it is not necessary to destroy the labourers ; for the heath now comes into blossom, and, provided the weather prove propitious, presents a rich harvest of honey to the bees, whose wants are thus, partially at least, supplied ; and, by the addition of two or three pounds of sugar made into syrup and judiciously administered, they will in all probability survive the winter and spring, and swarm on the return of summer. Three important advantages are gained by deprivation,—the honey is secure in our possession, the bees are preserved, and, the skapes being lightened, can be transported with facility to fresh pasture, thereby enabling the cultivator to draw the greatest possible profit from his bees.

The time allowed to the bees, however, for collecting their winter provender is thus very limited ; their operations are frequently interrupted by unfavourable weather, and it must not be disguised that failures are common. But though failures often originate in causes over which we have no control, still we do not hesitate to affirm, that they as often

originate in the inconvenient construction of the common straw skape. Certain it is, that this skape is not well adapted to the culture of bees. These insects always store their honey towards the top of the combs, while the brood occupies the lower parts. We cannot, therefore, come at the honey till the rods, which the width of the skape renders necessary, are extracted ; the combs are then cut out, and the bees are at once robbed of their young and of the whole of their provision.

Doubtless both these are great grievances ; but the loss of their young, if in this case we may judge analogically, is peculiarly distressing. Hence that langour and listless idleness which, after deprivation, we frequently observe pervade a hive that before exhibited all the symptoms of industry and activity—hence the reason why the bees of deprived hives sometimes dwindle gradually away till not one remains.

These are facts with which cultivators are not unacquainted, and we denounce the common skape as their principal cause. Some, indeed, who use this skape, avert the calamities just mentioned.—After all the combs are taken out, the upper parts containing the honey are cut off from the lower containing the brood ; the latter are returned to the

skape, and fixed with slender splits of briar, as already directed, (page 67.)

This is a very laudable practice, and cannot be too warmly recommended to those who are determined, in defiance of common sense and sound argument, to persist in the use of the common skape. By this method the brood is not only preserved, but, though bad weather should immediately succeed the deprivation, the bees do not perish, for if their proprietor has not been too avaricious, a considerable number of cells, filled with honey, will remain in each comb, as a resource. This operation, however, is very troublesome at first, and in the following autumn the difficulties are renewed; for the combs cannot be extracted without being much broken, and, consequently, much of the honey lost, not to speak of the injury done to the skape by perforating it with so many rods.

It is always observed of deprived hives, that such as are weak generally perish, while those that are strong live and flourish. We here repeat what we have already said, that a certain number of bees forming one community, will collect a greater quantity of honey than the same number divided into two; and, with regard to deprived hives, we say, that six pounds weight of bees lodged

in the same skape will, in a given time, collect as much honey as eight pounds weight of bees divided into two communities of four pounds each. Our assertion is borne out by facts. No hive that has suffered deprivation can be expected to collect a sufficiency of sustenance for the winter and spring, unless it weighs six or seven pounds, but if it weigh eight or ten pounds, its success may be pronounced certain.

The mode of management, therefore, which we would recommend is, that, about the beginning of August, every hive in the apiary, except such as are judged to have less than five pounds weight of honey, be laid under contribution ; and, in order to form very strong communities for stock-hives, (for these should all be made up at this season,) let two or more of those that have been deprived be united into one, observing to make them all as nearly equal in strength and riches as possible ; this done, let the whole, without exception, be transported to the heath pasture.\* We would earnestly press upon the attention of cultivators the propriety, nay the necessity, of uniting the deprived hives at this season, when every moment is doubly precious.

\* In countries where there is no heath, mignonette ought to be cultivated upon a large scale.

It will readily suggest itself to any one, that before we can plunder a skape of the common construction, the bees must be dislodged. This is a troublesome and rather an awkward operation, and is usually effected in the following manner :—The skape that is the subject of operation is placed invertedly, and an empty one of equal diameter, if such can be conveniently obtained, is placed over it mouth to mouth ; a cloth is then wrapped round them to prevent the escape of the bees ; and by drumming with both hands upon the undermost skape, the bees, in dread of danger, will betake themselves to the upper one as a safer habitation. The operator must rather beat quickly than violently, and principally upon those parts of the skape to which the edges of the combs are attached, as, by beating opposite their flat sides, he might lose them, and by their falling together, injure the brood, and crush the bees, or drown them in their honey. By dislodging the bees in this way, an artificial swarm may be formed.

There are very few authors who have treated on bees who have not condemned the use of the common skape. To its inconvenient construction must be attributed the custom of suffocating the bees at the end of the season, a measure which all acknowledge, tends to diminish the collection of honey

next year. But it is unnecessary to enumerate its many defects ; they are felt in the difficulty of performing any operation, and, as we proceed, they will be seen and understood. It is not our intention to describe all the skapes that have been invented, this would not only cause us to overstep our limits, but would be unserviceable to the apiarian. The most experienced and best informed cultivators use skapes that open on more sides than one, and to the description of such we shall confine ourselves.

*The Grecian Skape.*—The Greeks about Mount Hymettus, as we are informed by Sir George Wheeler, in his “Journey into Greece,” use a skape shaped like a flower-pot, that is, wider at the top than the bottom, so that the combs require no cross rods as supports. It is open below like the common skape, and across the top are laid several flat sticks to which the combs are attached ; these sticks are plastered over with clay ; and to secure them from the weather, they are covered with a tuft of straw, as is sometimes done in this country.

Mr. Huish has adopted the Grecian skape under a partial modification. As used by him, the spars at the top, to which the combs are fastened, are seven in number, each an

inch and a half broad, and a quarter thick. Over these is laid a piece of net-work to prevent the bees from working in the spaces between them ; above this a circular cover composed of five boards connected by hinges ; in this cover are six apertures closed with plates of tin perforated with small holes, to let out the heated steam of the hive ; and the whole is covered with a straw top, wrought in the same manner as the body of the skape itself. This top is highest in the centre, and has a gradual declivity towards the circumference, to facilitate the flowing of the water, produced by the condensation of the vapours of the hive.

This water, Mr. Huish would have us believe, is so copiously produced as to endanger the safety of hives lodged in skapes having a flat top. This apiarian must have forgot, that, in every hive, a certain number of bees continually employ themselves in ventilating their habitation, and that the vapours are thus expelled at the entrance. This will not be the case, however, unless the skape is close above, for if an opening be left there, the steam will pass off with the current of air thus established ; and, in this case, the cold will penetrate, and we do not dispute that a little moisture may be perceived about the vent. The cold in the void

that is left between the convex top and the hinged cover of Mr. Huish's skape must have a powerful tendency to condense the steam; but that such large quantities of water, as he insinuates, is ever generated in a skape we do not hesitate to deny. A great part round the centre of the roof of almost all the common straw skapes that we have seen is quite flat, and the roof of wooden skapes is perfectly so; yet it is allowed by all that these are salubrious habitations. We know no reason, then, for giving skapes a convex roof, and we are sorry Mr. Huish should have lent his authority to establish a groundless alarm in the minds of the inexperienced.

In the Grecian skape, as it is intended each spar shall be the foundation of a comb, by separating the comb from the sides of the skape, it may be drawn up at the top; and in this way is the deprivation performed; choosing the combs at each outside as these are more plentifully stored with honey than those nearer the centre, the lower parts of which are destined for the brood. The upper parts of the brood combs are, however, filled with honey, which cannot well be taken. The honey, therefore, from this skape is not so abundant as could be wished, and, consequently, one great object, the lightening of

the skapes for the convenience of transportation to the heath pasture, is partly lost.

*Favignanese Skape.*—In Favignana, a small island on the west coast of Sicily, bees are lodged in oblong wooden boxes, both ends of which are moveable. Of these boxes we have not learned the dimensions; but we should think ten inches square in the end, and seventeen or eighteen inches long, will give a proper capacity for our climate. This skape, it is probable, is laid horizontally on four props, and the entrance made at the lower part of the end in front.

If a hive be in possession of any honey at all, it will always be found in the most remote part of the dwelling. When honey-combs, therefore, are to be taken from the Favignanese skape, it is removed to a little distance from the apiary, the entrance is shut, the farther end opened, and the bees driven forward by means of smoke, when the honey-combs are cut out, and those which contain a considerable quantity of brood are left untouched; for the young is the hope of the community, and ought to be held sacred. The skape is then returned to its station, but its position is reversed, the entrance being made in that end from which the combs have been extracted. The bees

then replenish the vacancy, and, as soon as the combs farthest from the new entry are divested of brood, they fill them with honey, which, on a future occasion, is again taken, and the skape reversed as before.

When a swarm is first lodged in one of these boxes, it is probable the proprietor guides the bees in the position of the combs, by fixing one across the skape; for were they built either obliquely or longitudinally, the difficulty of deprivation would be greatly increased.

The skape used in Favignana is at once cheap, simple, and excellent. All things taken into consideration, we think it superior to the Grecian skape, but liable to the same objection, as far as regards the lightening for the convenience of carriage.

*Storied Skapes.*—The fact, that the upper parts of all the combs are filled with honey, while the lower are reserved for the brood, naturally suggested the idea of employing skapes composed of separate stages, placed one above another; for, by this means, the bees could be deprived of almost all their honey, with the greatest facility, without molesting the brood, merely by removing the upper story. The principle upon which this skape is constructed is certainly less liable to

objection, than any other ; and, except that used in Favignana, which some may prefer on account of cheapness, there is no other that will give such satisfaction.

Storied skapes have been made of both wood and straw, but the former seems in general, to have been preferred. Those of wood have generally been of a square form, but they have also, from the idea of better concentrating the heat for the nourishment of the brood, been used, by different apiarians, of a circular and also of a hexagonal and octagonal form. It is extravagant, however, to increase expense, when no good purpose is served ; and experience warrants the assertion that bees thrive equally in square skapes with those of any other construction.

Mr. Thomas Wildman, a celebrated apiarian, who wrote in the year 1770, effected a great improvement in the construction of storied skapes. Previous to his time, a single hole in the middle of the roof of the lower stage served as a passage of communication between it and the upper one ; but as the combs were carried uninterruptedly through this aperture, a great obstacle was thus presented to the separation of the boxes. To obviate this inconvenience, Mr. Wildman adopted the plan of the Grecian skape, as far as regards the spars on the top, which

serve as foundations to the combs ; but instead of being moveable, he fixed the spars with nails, a deviation for which we cannot well account. Over the spars of the upper stage he laid a piece of clean paper, and covered the whole with a flat top, of the same material as the skape.

In 1780, Mr. Keys published his “ Practical Bee-Master,” in which he advocates the superiority of the *sparred story-skape*, as it may be called. This apiarian directs, that slips of iron, for which we substitute glass, be used for closing the intervals between the spars of the upper story. This will be found more convenient than a piece of paper laid over them, according to Mr. Wildman’s plan. Besides this there are other minute differences between the skape of Keys and that of Wildman ; they agree, however, in principle ; and in the construction of the one which we are about to propose, we have combined the advantages of both, while the construction is simplified, and the expense diminished.

*Sparred Story-skape.* FIGURE 4 is a representation of the skape which we use, composed of two boxes, one above the other, with its floor-board below, and its cover at the top, ready to be placed upon the skape. The cover, it will be perceived, has a downward ledge, at least half an inch deep.

The boxes are made of fir deal, three quarters of an inch thick after being planed. The inside dimensions of each are twelve inches by nine, and eight inches deep; the whole depth of the skape is, therefore, sixteen inches, and its capacity one solid foot. Each box has eight wooden spars, one inch broad, and three-eighths thick, as a foundation to the combs. The length of the upper side of each spar is nine inches and a half, while the under side is only nine inches, a *half-check*, as tradesmen say, of a quarter of an inch being made in the under side at each end, which will be understood by examining the figure in the plate. But the upper side of the spars must be *flush* with the upper edges of the boxes, wherefore a check must be made to receive the spars in the long side of the boxes also. The intervals between the spars are exactly half an inch wide, except the first and ninth, which are only one quarter. The intervals between the spars are intentionally left wider than those between the combs; this, however, does not prevent the bees in prosecuting their works from gaining the proper distances. These spaces in the upper box are closed with slips of glass,\* the ends of which rest on the same check as the

\* The slips of glass may be procured from any glazier at twopence per dozen.

spars. In the under box all the intervals are left open, not only that the bees may have a more ready passage up and down, but also that the whole interior air of the skape may be of the same temperature. Mr. Keys also found that in the sparred story-skape the bees, after having filled the upper box, commence operation in the lower one more readily than if there were only one opening. "These examples (says he) prove incontrovertibly the propriety and advantage of bars, over any other construction, the reason seems to be this, the openings between the bars coincide so well with those between the combs, that the bees meeting with no obstacle to their ascent, are deceived into a notion that the two boxes are but one ; and therefore carry on their works without hesitation."

From what has been said it will be perceived that the spars dip three sixteenths below the glass slips, thus presenting a prominent surface as a foundation to the combs, which the bees will follow ; and as the spars are moveable, the combs are easily extracted. The entrance for the bees is three inches long and five sixteenths high.

The floor-board is an oblong fifteen inches by twelve, and three-fourths thick ; with these dimensions it will project three quar-

ters of an inch beyond the skape on all sides. To prevent its warping it ought to be formed of two pieces, each twelve inches by seven and a half, and have one or two bars nailed along the back to strengthen the whole. For the sake of convenience, when transporting the skapes to the vicinity of fresh pasture, but principally for the sake of cheapness, the flight-board is moveable, and is formed of a piece of waste board, five inches long and three broad. It is fixed to the middle of one of the long edges of the board by means of two wooden pins fastened into its edge, and there are two corresponding holes to receive them in the board. In short, it is attached to the board in the same way as coopers unite the several pieces composing the ends of a barrel. Those who do not choose to have the flight-board moveable, may form the floor-board of three pieces, the middle one being two inches longer than the other two.

We would here urge the propriety of making all the covers, boxes, boards, and spars, respectively, of such equal dimensions that any one of these may, indiscriminately, suit any skape.

Price of our skape as furnished by our tradesman :—Floor-board complete  $4d$  ; Cover do.  $4d$  ; 16 spars  $3d$  ; 9 slips of glass  $1\frac{1}{2}d$  ; wood

for both boxes, best home fir,  $10\frac{1}{2}d$ ; nails  $1\frac{1}{2}d$ ; paint  $2d$ ; workmanship  $7d$ ; all which items added together gives a total of  $2s. 9\frac{1}{2}d$ .

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#### MANNER OF OPERATING WITH THE SPARRED STORY-SKAPE

*Manner of dislodging a Hive, and seizing the Queen.*—Let two skapes, one of them containing the hive that is to be dislodged, and the other empty, be placed upon a table or a large board, with their entrances turned toward each other, but separated by a distance of about one foot. A flat tube one foot long, two inches broad, and five sixteenths of an inch deep, is to lie between the apertures as a passage of communication; the upper side of this tube is a pane of the clearest glass, and the other three sides are of tin. Remove the cover from the inhabited skape, raise all the slips of glass, so as to admit smoke, but not so much as to allow the bees to escape. In order to give the smoke a proper direction it is injected into a box placed on the top of the skape. This box, like the skape, is exactly  $13\frac{1}{2}$  by  $10\frac{1}{2}$  inches on the outside, but only  $1\frac{1}{2}$  inch deep within; it is open below, and has a fast cover

on the top ; there is, moreover, a hole in the middle of one of its sides three inches long and a quarter of an inch wide for receiving the tapering end of the fumigating box described at page 63. Having laid a weight on the top of the box, to keep it close down to the skape, apply the fumigating box at the hole just mentioned, and with the bellows impel the smoke into the skape, the bees will descend precipitately and rush through the tube into the empty skape.

When the object of dislodging the bees is to seize the queen, two persons are engaged; one operates with the bellows, while the other observes the bees narrowly as they pass under the glass of the tube. Whenever the queen makes her appearance, which may not be till most of the bees have departed before her, she is to be imprisoned by insinuating a small piece of tin at each end of the tube, and another piece of equal size is to be introduced between that and the skape to close the entrance, when the tube with its shutters is removed. We can now proceed as we have a mind, for, having taken away the tube with the queen, we can lay another in its place, and, the shutters being removed, the remaining bees may be forced to take refuge with their comrades.

*To form an artificial Swarm.*—About the first of June, at eleven o'clock of a bright day, when a great number of the bees are abroad, remove the skape to some distance from its station, and dislodge the bees, together with their queen, by means of smoke applied at the top of the skape as just directed. After the bees are dislodged, the stock-skape is to be returned to its place, and the swarm set as distant from it in the apiary as possible, or at once removed several miles. The stock will be repeopled by the bees returning from their excursions; they will rear a queen for themselves, and discharge all the functions of the hive. It is more than probable, indeed, that, so late as the first of June, a young queen is already fast approaching to maturity.

*Feeding.*—The feeding trough described at page 72 is well adapted to our skape. We generally place it on the flight-board as already directed; but we have sometimes also found it convenient to apply the entrance of the trough to that of the upper box. In this case, the trough is supported on the ends of two upright boards, and the doorway at bottom may be left open. Another method of feeding, is to take an empty comb from the poor stock, and a full comb from a

rich one, and put the one comb in the place of the other. This last operation is very easily performed with the sparred story-scape, as all the spars are moveable, and the comb may be readily separated from the sides of the box with a knife.

In the same way may a weak hive be re-inforced in the spring, by exchanging some of its empty combs, for others filled with brood, taken from several strong hives. This is often a most advantageous operation, and in our opinion is the only way in which a hive ought to be re-inforced in the spring.

*Deprivation.*—Whoever would make the most of his bees must never let them be in want of room ; whenever there is any appearance of this, to excite their industry, the skape must be eked, by adding a third box below : in short, during the whole honey season, the combs ought never to reach the board. The beginning of August is the season of deprivation ; any brood that may have been in the upper box, is now hatched, and, unless the season has proved unpropitious, all the cells are filled with beautiful vale-honey.

The method of taking away the upper box is very simple ; the combs being generally fixed to the spars below, are to be separated

with a long thin knife, a wire, or a stout thread. Stop the entrance of the skape with a perforated shutter; cause the bees, by means of smoke, to betake themselves to the lower part of their habitation; and the box of honey may then be removed with the greatest facility. After this the number of stocks that are to be kept over winter must be made up, by placing two under boxes, each containing a hive, as well as the brood, one on the top of the other, and thus will the communities be at once united and provided with a habitation. This is the method which we adopt for uniting hives at the season of deprivation, and we have found it successful. The work of death is left to the queens themselves; but, if thought preferable, one of the queens may be taken prisoner in the manner already pointed out.

It seldom happens that there are any brood in the upper box at this season; but even though there were, it can be easily preserved by putting it into some of the skapes. Should the brood, however, be trifling in quantity, it is unnecessary to be at this trouble.

It is well known that new comb is white, but that it soon becomes yellow, and ultimately blackish; and it is equally notorious that the whitest comb brings the highest

price. In order, therefore, to obtain the comb in its primitive whiteness, and at the same time, stored with the most fragrant and beautiful honey, it must be taken in about three weeks after the settlement of the swarm. Immediately after the swarm is skaped, and before it has commenced operation, take out the glasses between the spars, place two half boxes, that is, such as are only four inches deep, above the one containing the bees, and they will rush up to the upper box, which they will soon fill, when it may be removed without injury to the brood, which, in general, occupies a lower place. The other half box may be taken at the usual time.

With regard to the disposal of the produce of the bees, we would recommend to sell the produce of the swarms in comb, being whitest, and to eke the stock skapes immediately after the departure of the first swarm, that they may be prevented from throwing a second ; and thus be enabled, at the usual season of deprivation, to yield their top box full of honey, which should be run and sold in pots.

The comb may be sent any distance to market in the half boxes without receiving any injury, merely by laying them in a cart on a quantity of hay or straw.

## CHAP. XVII.

## MANIPULATION OF HONEY AND WAX.

The honey ought to be run immediately after the hive is dislodged. The empty portions of comb, and such as contain farina, are laid aside to be afterwards converted into marketable wax. Particular care must be taken of any portions of comb that may happen to be filled with brood ; such pieces must be put into a box and given to one of the weakest hives. The combs stored with honey are cut into slices horizontally through the cells, and several pieces at a time are put into a wooden or a tin frame, of about six inches deep and twice as wide at the top as at the bottom, having within it two moveable wire drainers or sieves, one above the other, with two inches of interval between them. The upper sieve sustains the combs ; its meshes are a quarter of an inch square, while those of the lower are only one sixteenth, that it may arrest all the small particles of wax. A thin muslin bag, of a conical form, that is, wide at top, and tapering to a point at bottom, hangs below the sieves, being attached to the frame by means of several

small hooks. Through this bag the honey filtrates, and is received into an earthen pot, placed below, quite pure and fit for market. The draining apparatus may be suspended between the backs of two chairs. When the honey ceases to run, remove the broken combs and put fresh ones in their place ; and when the whole is gone over in this manner, in order to obtain all the honey, squeeze the combs in a coarse thin towel : the honey thus obtained is less pure, but is very good for feeding poor stocks. Even after all this the squeezed combs may be steeped in water, for the purpose of making weak mead (bragwort) ; but before the combs are put into the water, the whole draining apparatus ought to be washed with it, which will add considerably to the strength of the mead.

Of all the methods of purifying wax, with which we are acquainted, there is none equal, either in regard to simplicity or efficiency, to that recommended by the Abbé Della Rocca in his " Complete Treatise on Bees."—The combs, being tied up in a woollen or linen bag of moderate thickness, are put into a pot of boiling water. The heat melts the wax ; it escapes through the bag, and rises to the surface, while the dross is retained. The wax is to be skimmed off and put into a bowl or other vessel, with a wide mouth and nar-

row bottom, into which a little cold water has been previously poured to prevent the wax from sticking ; and to prevent its cracking, let it be set in a pretty warm situation that it may cool gradually.

FINIS.

George W. Cartney.  
Beechgrove,  
Kirkpatrick-Durham,  
By Castle-Douglas.  
Scotland,

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Fig. 2



Feeding Trough

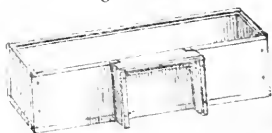


Fig. 3.

Fig. 1.

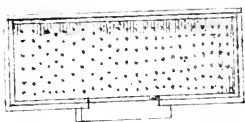


Fig. 4

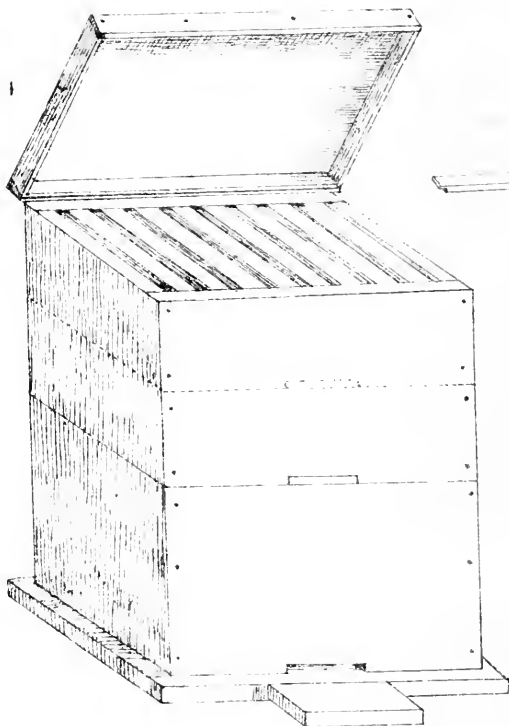



Fig. 5.



Scale of  Inches

Sparred Storey-Skape.

## EXPLANATION OF THE PLATE.

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FIG. 1. Plan of the *Feeding Trough*; length 9, breadth 3, and depth 2 inches, all inside measure. The thickness of the wood is about three-eighths of an inch. In this figure, the trough is supposed to be standing on its bottom in the usual position, and the eye of the observer right above it: he thus, through the glass cover, which rests in a *half check* at the top of the Trough, sees the *float* on which the Bees stand while imbibing the syrup through the holes. The float is nearly one-eighth inch thick, and the holes, marked by the dots, are between a sixteenth and an eighth wide. The projecting piece of wood covers the entrance.

FIG. 2. This figure exhibits an upright view of the Trough, with its entrance darkly shaded under the thin piece of wood just mentioned. The passage up the side of the trough from the aperture of the skape, is inclosed by a piece of wood, on each side, reaching to the bottom. The dots are the nails which fasten the pieces of wood to the trough.

FIG. 3. A full view of the Feeding Trough.

FIG. 4. *The Sparred Storey-Skape*, composed of two boxes, one above the other. The cover is raised up, so as to expose the eight moveable spars, to which the combs are attached. The spars are each one inch broad; they are left white in the figure, and the dark intervals between them represent slips of glass. The skape is drawn as if standing on its board, which has a moveable flight-board. The under entrance is open, the upper one shut. The dotted line and entrance on the upper box is intended to illustrate what was said at page 121, regarding the placing of two half-boxes above the lower one, when honey-comb is to be taken soon after the season of swarming.

FIG. 5. Is one of the spars of the skape; the under side, to which the comb is fixed, is 9 inches long; but the upper side is half-an-inch longer, namely, a quarter at each end, the spar being *half-checked* so as to rest in a corresponding *half-check* in the skape. The whole thickness of each spar is three-eighths, one half of which dips below the glass slips.













